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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 6, NUMBER 6
MARCH 15, 1973

W73-03251—W73-03900

U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF WATER RESOURCES RESEARCH
WATER RESOURCES SCIENTIFIC INFORMATION CENTER

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 6, NUMBER 6
MARCH 15, 1973

W73-03251--W73-03900

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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05 WATER QUALITY MANAGEMENT AND PROTECTION
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09 MANPOWER, GRANTS AND FACILITIES
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

POTENTIAL GEOTHERMAL RESOURCES IN MONTANA,
Montana Bureau of Mines and Geology, Billings.
C. A. Balster, and S. L. Groff.
In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Publication, Paper G, 1972. 9 p, 1 fig, 1 tab, 3 ref.

Descriptors: *Geothermal studies, Conferences, *Subsurface waters, *Thermal power, *Montana, Thermal water, Thermal springs, Water temperature, Thermal properties, Geology, Wells, Hydrogeology, Geophysics, Exploration, Reviews.
Identifiers: *Geothermal resources, *Thermal energy.

Only one area in Montana has been classed as a known geothermal resource area (KGRA). It is in the extreme southern part of Montana, near Yellowstone Park. The KGRA includes 12,763 acres but no exploratory efforts to prove the resource potential have been attempted. An additional 3,834,000 acres has been classed as prospective areas of geothermal resource value. Many areas in the state are characterized by thermal springs. Some of these springs have very large flows, but temperatures are generally not high (usually less than 100 F). Some distance west of the Yellowstone Park area is an area of potential geothermal value known as the 'Snowcrest-Gravelly Range' area. It is underlain by rocks ranging in age from Precambrian to Cretaceous. No extrusive or intrusive rocks crop out, and a source of heat must be attributed to a deep-seated igneous intrusion. Considering the relationship of the area to the Yellowstone Park province, such an intrusive mass could most logically be associated with the Yellowstone Park volcanic rocks. Leasing of state-owned lands would come under the jurisdiction of the Department of State Lands, Helena, Montana. There is no known policy on leasing of prospective geothermal acreage. (See also W73-03419) (Woodard-USGS)
W73-03426

1B. Aqueous Solutions and Suspensions

DIFFUSION OF SEA WATER IONS--I. DIFFUSION OF SEA WATER INTO A DILUTE SOLUTION,
California Univ., Los Angeles. Dept. of Geology.
For primary bibliographic entry see Field 02K.
W73-03408

CRYSTAL NUCLEATION FROM SOLUTION,
Case Inst. of Tech., Cleveland, Ohio.
For primary bibliographic entry see Field 03A.
W73-03435

THE EFFECTS OF ETHANOL-WATER AND DIMETHYL SULFOXIDE-WATER SOLVENT SYSTEMS ON THE CONDUCTIVITY OF HYDROCHLORIC ACID, SODIUM HYDROXIDE, AND POTASSIUM CHLORIDE,
Southwest Texas State Univ., San Marcos. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W73-03605

02. WATER CYCLE

2A. General

A PHYSICS-BASED APPROACH TO HYDROLOGIC RESPONSE MODELING. PHASE I: MODEL DEVELOPMENT,
IBM Watson Research Center, Yorktown Heights, N.Y.
R. A. Freeze.
Completion Report, Sept. 1972. 120 p, 11 ref, 2 append. OWRR C-3144 (No 369F) (2).

Descriptors: *Model studies, *Computer models, *Mathematical models, *Surface-groundwater relationships, *Small watersheds, *Rainfall-runoff relationships, Subsurface runoff, Saturated flow, Unsaturated flow, Unsteady flow, Base flow, Infiltration, Streamflow, Open channel flow, Hydrographs.
Identifiers: Three-dimensional model, Numerical solutions, Deterministic model, Seepage face, Shallow-water equations.

Watershed response is simulated with a deterministic mathematical model that couples three-dimensional, transient, saturated-unsaturated subsurface flow and one dimensional, gradually-varied unsteady channel flow. The subsurface flow model uses the line successive overrelaxation technique to solve numerically the Jacob-Richards diffusion equation. The channel flow model uses the single-step Lax-Wendroff explicit technique to solve numerically the full shallow water equations. Applications of the model are presently limited to the simulation of single hydrologic events on individual slopes feeding single streams. The model has been applied to some hypothetical basins to investigate the mechanisms of runoff generation. The simulations provide an explanation of the observation that classic Hortonian overland flow is a rare occurrence in time and space, and they also show that there are stringent limitations on the occurrence of subsurface stormflow as a quantitatively significant runoff component. The simulations provide theoretical support for the runoff-generating mechanisms observed in the field by Dunne. The report contains a summary of these results, which are fully described in a series of three journal articles. The report also provides listings of the computer programs that constitute the mathematical model.
W73-03257

EVALUATION OF STREAMFLOW FORECASTS FOR RESERVOIR OPERATION,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 04A.
W73-03268

HYDROLOGIC INVESTIGATIONS OF SMALL WATERSHEDS IN OHIO: PHASE II. 1969-1972,
Ohio State Univ., Columbus. Water Resources Center.
P. E. Taiganides, and V. T. Ricca.
Available from the National Technical Information Service as PB-213 839, $3.00 in paper copy, $0.95 in microfiche. Ohio Water Resources Center Completion Report, Project No 342X, 1972. 111 p, 37 fig, 16 tab, 54 ref. OWRR B-019-OHIO (6).

Descriptors: *Agricultural watersheds, *Small watersheds, *Storm runoff, *Model studies, *Ohio, Appalachian Mountain region, Computer models, Simulation analysis, Strip mines, Infiltration, Equations, Streamflow, Flow rates, Watershed management, Water quality, Planning.
Identifiers: Strip-mining effects, *Little Mill Creek (Ohio).

Hydrologic phenomena associated with small watersheds located in the Little Mill Creek and in the USDA North Appalachia experimental watersheds near Coshocton, Ohio, were investigated using the Stanford Streamflow Simulation Model. Also, a fundamental approach to watershed modeling was initiated to solve the two-dimensional Darcian partial differential equations to obtain the infiltration component of the hydrologic cycle and to solve the equations of flow over an infiltrating watershed. The Alternating Direction Implicit (ADI) method was used effectively to model a two-dimensional, completely saturated and completely unsaturated flow. The effects of strip mining and conservation practices on the quality of runoff water were investigated, using traditional statistical techniques. The hydrologic response of the strip-mined watershed does not seem to defer significantly from an agricultural watershed during intense storms. The basis for comparison was percent total yield and percent direct runoff from selected storms. (Woodard-USGS)
W73-03277

A MODEL TO PREDICT MEAN ANNUAL WATERSHED DISCHARGE,
Federal Highway Administration, Washington, D.C.
For primary bibliographic entry see Field 04A.
W73-03308

USING HYDROLOGIC MODELS TO PREDICT THE EFFECTS OF WATERSHED MODIFICATION,
Minnesota Univ., St Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04C.
W73-03539

GENERALIZED COMPUTER MODEL TO SIMULATE THE HYDROLOGY OF A STREAM BASIN,
Kansas Univ., Lawrence.
R. M. Knapp, D. W. Green, E. C. Pogge, and B. E. Schorn.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 132-137, 1972. 8 fig, 13 ref.

Descriptors: *Computer models, *Hydrology, *Watersheds (Basins), *Surface waters, *Groundwater, Systems analysis, Input-output analysis, Hydrologic data, Streamflow, Runoff, Groundwater movement, Meteorological data, Topography, Vegetation, Soil types, Model studies.
Identifiers: Little Arkansas River (Kans).

A computer model was developed to simulate the hydrology of a stream basin, including both surface water and groundwater phases and their interaction. Input to the model includes precipitation, climatic conditions, boundary and intitial conditions, and basin constants. Provision is made for modeling withdrawals from both groundwater and surface waters for consumptive use. The computer output includes streamflow hydrographs at selected points, groundwater levels, and groundwater recharge and discharge from the basin. The model is designed so that it will be applicable to different basins with similar geographical and geological conditions. The structure of the model is such that the basin is divided vertically into four layers and a stream network. Provision is also made to subdivide each layer horizontally into subbasins. The surface subbasins are determined by considering topography, soil types and climatic data. The method is described including a description of the transport processes involved and a discussion of the assumptions and limitations of the model. In addition, results from computations for a hypothetical basin are presented. Immediate

plans are to apply the simulator to the Little Arkansas River in south-central Kansas. (See also W73-03536) (Woodard-USGS)
W73-03540

THE ANALYSIS AND APPLICATION OF A DIGITALLY SIMULATED ELECTRONIC WATERSHED ANALOG,
Arizona Univ., Tuscon. Dept. of Watershed Management.
For primary bibliographic entry see Field 07C.
W73-03541

A METHODOLOGY FOR WATERSHED EVALUATION,
State Univ., of New York, Binghamton. Dept. of Geology.
M. Morisawa.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 153-158, 1972. 1 fig, 9 tab, 2 ref. OWRR C-1214 (No 1966) (2).

Descriptors: *Watersheds (Basins), *Evaluation, *Environment, *Classification, *Methodology, Hydrologic aspects, History, Aesthetics, Recreation, Hydrologic budget, Rainfall-runoff relationships, Streamflow, Flow characteristics, Flood recurrence interval, Indexing.

Eight rivers with a wide variety of environments were studied to develop methods for categorizing and inventorying the geologic, hydrologic, historical, aesthetic, and recreational aspects of watersheds. Geological classifications and evaluation were based on geologic structure, landforms, riverforms, rock types, and collecting sites. The rating scheme for hydrologic factors included: (1) water budget as runoff/rainfall ratio, (2) variation and regulation of flow expressed by variability index for seasonal changes, coefficient of variation for annual changes, low flow duration, maximum flow index, and impoundments, and (3) flood recurrence and magnitude. Historical inventory and ratings are based on sites of anthropological interest, local history and national history. Recreational capacity and potential were determined by kinds of recreation available in terms of land-based or water-based and as active or passive activities. Aesthetic evaluations taken in the field agreed well with rankings made from slides of the same stations and rated indoors by 45 students. The methodology developed can be applied by others in surveys for management or conservation purposes. Use of this inventory and evaluative scheme will serve to maximize planning and promotion of the potential and quality of river environments. (See also W73-03536) (Woodard-USGS)
W73-03542

MONTANA WATER RESOURCES AND PLANNING.
Montana Water Resources Board, Helena.
For primary bibliographic entry see Field 06A.
W73-03645

STRUCTURAL ANALYSIS OF HYDROLOGIC TIME SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
Colorado State University Hydrology Paper, No 56, November 1972. 59 p, 10 fig, 2 tab, 13 ref.

Descriptors: *Hydrology, *Structural analysis, *Time series analysis, Analytical techniques, Mathematical studies, Hydrologic data, Frequency analysis, Statistical methods, Precipitation (Atmospheric), Runoff, Stochastic processes, Model studies.
Identifiers: *Hydrologic time processes, Hypotheses.

Structural analysis and mathematical eescription of hydrologic time series are based on a set of well defined hypotheses, with the assumption that a development cannot be better than hypotheses underlying it. Techniques are presented on how to infer the existence of periodic deterministic component parameters in time series. The unavailability of exact inference techniques is replaced by approximations, whenever the complexity of hydrologic time series does not justify the use of existing statistical inference techniques. Once periodicities are inferred; Fourier analysis is used to mathematically describe periodicities in parameters by a minimum number of low frequency harmonics and their estimated coefficients. Inferred dependence models for the stationary stochastic components of a given order of stationarity, after all periodicities in parameters are removed, are basically of the autoregressive linear type. The assumption is that the autoregressive coefficients may be both periodic and nonperiodic. Several misinterpretations of autoregressive linear models are discussed. These misinterpretations are due to doubts often advanced by some superficial arguments on the applicability of these models in hydrology. The frequency distribution curve of the independent stochastic stationary component, derived from the inferred dependence model, is approximated by best fit as one among various probability distribution functions studied. (Woodard-USGS)
W73-03738

MORPHOMETRY OF THREE SMALL WATERSHEDS, BLACK HILLS, SOUTH DAKOTA, AND SOME HYDROLOGIC IMPLICATIONS,
Forest Service (USDA) Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
T. Yamamoto, and H. K. Orr.
USDA Forest Service Research Paper Rm-93, July 1972. 15 p, 5 fig, 7 tab, 13 ref.

Descriptors: *Hydrology, *Small watersheds, *Geomorphology, *South Dakota, Forest watersheds, Water yield, Rainfall-runoff relationships, Streamflow, Peak discharge, Analytical techniques, Data collections, Correlation analysis.
Identifiers: *Watershed morphometry, *Black Hills (So Dak).

Detailed form (morphometric) comparisons of three small, contiguous watersheds in South Dakota are reported. All three are on one of the granite-like early Tertiary intrusions that dot the northern Black Hills. Ponderosa pine forest dominates the entire area. The watersheds are assumed to be in 'steady state' which is quasi-time-independent. The study watersheds and their component subbasins of all orders are also assumed to be an 'ensemble' whose variation in space is a reflection of possible variation in time on a single watershed. This is the rationale upon which the detailed comparisons of the watersheds are based. The three study watersheds differ in gross area, gross water yield, and peak stormflows. It is postulated that dimensional elements having scale ratios most nearly the same as water yield are best related to or control yield, despite extreme distortion in other respects. Indications are that on one rock type and under spatially uniform climate--maximum length of master watershed and relief of the contained first order basins are more meaningful indicators of relative yield and stormflow peaks than is gross area. (Woodard-USGS)
W73-03744

STREAMFLOW COMPUTATIONS AND FORECASTS (RASCHETY I PROGNOZY STOKA REK).
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 04A.
W73-03747

FORECAST OF A STORM-FLOOD HYDROGRAPH BASED ON PRECIPITATION AND BASIN LAG (PROGNOZ GIDROGRAFA DOZHDEVYKH PAVODKOV PO OSADKAM S UCHETOM BASSEYNOVOY TRANSFORMATSII),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 04A.
W73-03749

WATER-BALANCE STUDIES ON RIVERS IN NORTHEAST USSR (ISSLEDOVANIYA VODNOGO BALANSA NA REKAKH SEVERO--VOSTOKA SSSR),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 04A.
W73-03754

2B. Precipitation

CLIMATOLOGICAL SUMMARIES FOR SELECTED STATIONS IN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 07B.
W73-03274

RAINFALL MEASUREMENT AT TAITA EXPERIMENTAL STATION, NEW ZEALAND: 1--VERTICAL RAINGAUGES,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
R. J. Jackson, and R. Aldridge.
Journal of Hydrology (New Zealand), Vol 11, No 1, p 3-14, 1972. 3 fig, 3 tab, 16 ref.

Descriptors: *Rain gages, *Calibrations, *Demonstration watersheds, Instrumentation, Precipitation gages, Statistics, Gaging stations, Topography.
Identifiers: *New Zealand.

In New Zealand three networks of vertical rain gages were used to study the variability of rainfall in a 90-ha area of hilly and steep land, most of which is covered by scrub and forest. For individual storms, the standard deviation of gage catch ranged from slightly over 10% of the network mean for storms smaller than 7.5 mm to around 5% of the network mean for storms greater than 40 mm. For monthly totals of catch the standard deviation was usually between 3% and 7% of the network mean. An unbiased and sufficiently precise estimate of the network mean could be obtained from a selected single gage. Patterns of gage catch associated with wind direction or with altitude were observed for some storms. (See also W73-03279) (Knapp-USGS)
W73-03278

RAINFALL MEASUREMENTS AT TAITA EXPERIMENTAL STATION, NEW ZEALAND: 2--TILTED RAINGAUGES AND VECTOPLUVIOMETERS,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
R. J. Jackson, and R. Aldridge.
Journal of Hydrology (New Zealand), Vol 11, No 1, p 15-37, 1972. 6 fig, 4 tab, 10 ref.

Descriptors: *Rain gages, *Calibrations, *Demonstration watersheds, Instrumentation, Precipitation gages, Statistics, Gaging stations, Topography.
Identifiers: *New Zealand.

The rainfall catches of two networks of rain gages, one network with gages mounted vertically and the

other with gages normal to the slope, were compared over a 15-month period in a steep 4-ha scrub catchment. Measurements with vectopluviometers were used to classify the storms according to directional characteristics. In accord with the prediction from the data from the vectopluviometers the most important differences between the two networks occurred for strongly inclined rainfall from the north. For individual storms the mean catches of the two networks seldom differed by more than 10%, and for the whole period of observations the overall differences between paired tilted and vertical gages exceeded 20% in storms of more than 25 mm. Local topography often produced severe modifications of rainfall direction within the catchment, and vectopluviometers exposed to the general wind flow over the catchment were unreliable for predicting the catch of individual tilted gages. (See also W73-03278) (Knapp-USGS)
W73-03279

A MULTICHANNEL RECORDER FOR HYDROLOGICAL RESEARCH,
Ministry of Works, Christchurch (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 07C.
W73-03282

SNOWMELT PEAK FLOWS AND ANTECEDENT PRECIPITATION,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 02C.
W73-03545

HARMONIC ANALYSIS OF THE PRECIPITATION IN THE ATLANTIC WATERSHED IN COSTA RICA (IN SPANISH),
Servicio Agricola Interamericano, San Jose (Costa Rica). Departamento de Investigaciones.
R. Jaramillo, and G. Paez.
Turrialba. Vol 21, No 3, p 287-294. 1971. Illus. English summary.
Identifiers: Atlantic, *Costa Rica, Fourier analysis, Harmonic analysis, *Precipitation, Watersheds.

The objective is to determine the structure of the subseries of average precipitation on the Atlantic watershed for the period 1905-1970, using a harmonic analysis by Fourier series. The most important harmonics were determined as well as their corresponding periods, and the return time in which the harmonics of major significance show a maximum for each one of the months. There is evidence of the heterogeneity of the subseries, due mainly to the positions of frontal systems and of cyclonic activity. Likewise the structure of the subseries shows cyclical spectral variation. The results obtained serve as a starting point for establishing time series models for long-range forecasting in the area studied.--Copyright 1972, Biological Abstracts, Inc.
W73-03697

MAN'S IMPACT ON THE CLIMATE.
For primary bibliographic entry see Field 06G.
W73-03703

MICROCLIMATE MODIFICATION BY SLAT-FENCE WINDBREAKS,
Agricultural Research Service, Manhattan, Kans. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04A.
W73-03721

APPLICATIONS OF THE LOGNORMAL FREQUENCY DISTRIBUTION TO THE CHEMICAL COMPOSITION AND SIZE DISTRIBUTION OF NATURALLY OCCURRING ATMOSPHERIC AEROSOLS,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 02K.
W73-03722

THE EFFECT OF THE OBSERVATION TIME ON TURBULENT DIFFUSION IN THE ATMOSPHERE,
Mitsubishi Heavy Industries Ltd., Nagasaki (Japan). Nagasaki Technical Inst.
Y. Ide.
Water Air Soil Pollut, Vol 1, No 1, p 32-41, 1971, Illus.
Identifiers: Atmosphere, *Diffusion, Time, *Turbulence.

Turbulent diffusion from a fixed point-source is classified according to the length of the observation time with the aid of modern diffusion theory. The diffusion zone in the downwind is shown to consist of the linear, cuspidal, and parabolic zones. The effect of the observation time on the diffusivity coefficients and plume spreading is also discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-03723

THE INTERACTION OF LOCAL WEATHER AND AIR POLLUTION PROBLEMS,
Imperial Coll. of Science and Technology, London (England).
For primary bibliographic entry see Field 05B.
W73-03724

POTENTIAL ECONOMIC VALUES OF WEATHER MODIFICATION ON GREAT PLAINS GRASSLANDS,
South Dakota School of Mines and Technology, Rapid City.
For primary bibliographic entry see Field 03B.
W73-03725

CLIMATIC FLUCTUATIONS IN EUROPE BETWEEN THE 13TH AND 20TH CENTURIES AND THEIR REPERCUSSIONS ON THE FAUNA, (IN RUMANIAN),
Academia R. S. R., Cluj. Institutul de Spelologie.
G. Racovita, and A. Filipascu.
Ocrotirea Nat. Vol 15, No 1, p 23-34. 1971. Illus.
Identifiers: Climatic fluctuations, *Fauna, *Romania.

The main studies on climate evolution during the historical period concern territories of central and western Europe. Easton's statistical classification of winters (1928), which is based upon the numerical values of a 'temperature coefficient,' was adapted to southeastern Europe by calculating a 'continental coefficient.' There were no fundamental differences evident in the succession of various types of winters in these 2 regions of the continent; thus Easton's classification can be used for Romania. Statistical analysis of these data revealed the existence of a remarkable cold period corresponding to the 17th-19th centuries, for which the term 'microglacial period' was proposed. The harsh winters of Europe, especially those of Romania, and the mass disappearance of animals as a result of the cold and abundant snows are discussed. The negative consequences of harsh winters on the fauna appear to be becoming more accentuated in modern times parallel to the intensification of human intervention in the natural equilibrium. The zooclimatic factor is thus a noteworthy element in fauna protection.--Copyright 1972, Biological Abstracts, Inc.
W73-03732

HYDROLOGY--FULTON COUNTY, NEW YORK,
Fulton County Planning Dept., Johnstown, N.Y.
For primary bibliographic entry see Field 07C.
W73-03736

2C. Snow, Ice, and Frost

AVALANCHES--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from the National Technical Information Service as PB-213 828, Va. 22151, $3.00 paper copy; 95 cents microfiche. Water Resources Scientific Information Center Report WRSIC 72-216, November 1972. 87 p.

Descriptors: *Avalanches, *Bibliographies, *Abstracts, *Publications, *Documentation, Data storage and retrieval, Data transmission, Computers, Indexing, Ice, Landslides, Snow, *Snowpacks, Erosion, Mass wasting, Snow management Hydrology, *Glaciers.
Identifiers: *Author index, Descriptor index.

This is one in a series of planned bibliographies in water resources produced wholly from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 47,374 abstracts covering SWRA through October 1, 1972 (Volume 5, No. 19). Abstracts with full bibliographic details are listed in ascending Accession Number order. The Significant Descriptor Index is made up of a fraction of the total descriptors and identifiers by which each paper has been indexed. It represents weighted terms that best describe the information content. The Comprehensive Index represents all of the descriptors and identifiers by which each paper has been indexed. Through permutation, each word in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract. Author Index is included. (Woodard-USGS)
W73-03260

NEARSHORE GLACIAL-MARINE DEPOSITION FROM MODERN SEDIMENTS OF THE WEDDELL SEA,
Hope Coll., Holland, Mich. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W73-03292

ANALYSIS OF HYDROGRAPHS OF STREAMFLOW AND RECHARGE CAUSED BY AUFEIS (ANALIZ GIDROGRAFOV NALEDNOGO PITANIYA I STOKA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W73-03530

ARE EXISTING MEASUREMENTS OF PRECIPITATION INPUT TO WATERSHEDS ADEQUATE FOR MANAGEMENT DECISIONS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07B.
W73-03537

DEVELOPMENT OF MANAGEMENT GUIDELINES FOR INCREASING SNOWPACK WATER YIELDS FROM PONDEROSA PINE FORESTS IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 03B.
W73-03544

SNOWMELT PEAK FLOWS AND ANTECEDENT PRECIPITATION,
Utah Water Research Lab., Logan.
J. E. Fletcher, and G. W. Reynolds.

In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 197-199, 1972. 6 fig.

Descriptors: *Snowmelt, *Runoff, *Streamflow, *Peak discharge, *Utah, Idaho, Wyoming, Statistical methods, Hydrologic data, Curves, Snowfall, Water equivalent, Correlation analysis, Watersheds (Basins), Forecasting.
Identifiers: *Snow courses.

Forecasts of snowmelt peak flows are described for the region bounded on the south by Cedar City, Utah, on the north by Pocatello, Idaho, on the west by the Nevada State line, and on the east by the Green River. The forecasts were based primarily on snowfall. Snow water equivalent was chosen to represent snowfall. All of the snow courses in the area with records long enough to establish 10-year snow water equivalent values were used in the study. The data were arrayed and plotted. The annual and 10-year values were picked off the curve. All values were expressed as a percentage of the 2.33-year value. Thus the annual snow water equivalent would be 100%. (See also W73-03536) (Woodard-USGS)
W73-03545

AN EFFICIENT QUANTITATIVE METHOD FOR SAMPLING THE MEIOBENTHOS,
North Carolina Univ., Chapel Hill. Dept. of Zoology.
For primary bibliographic entry see Field 07B.
W73-03674

SNOW RESOURCES--FULTON COUNTY, NEW YORK,
Fulton County Planning Dept., Johnstown, N.Y.
For primary bibliographic entry see Field 07C.
W73-03737

INVESTIGATION OF RADIATION AND MECHANICAL PROPERTIES AND CALCULATION OF THAWING OF ICE COVER ON THE USSURI RIVER (ISSLEDOVANIYE RADIATSIONNYKH I MEKHANICHESKIKH SVOYSTV I RASCHET TAYANIYA LEDYANOGO POKROVA R. USSURI),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 04A.
W73-03756

SNOW COVER AND SNOW AVALANCHES IN MOUNTAINS OF KAMCHATKA (SNEZHNYY POKROV I SNEZHNYYE LAVINY V GORAKH KAMCHATKI),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 04A.
W73-03757

2D. Evaporation and Transpiration

TEMPERATURE AND TRANSPIRATION,
Aage Andersen.
Nord Jordbrugsforsk. Vol 51, No 4, p 226-235, 1969. Illus.
Identifiers: Relative Humidity, Leaves, Light, Peperomia obtusifolia D, *Temperature, *Transpiration, Uptake.

The influence of climatic factors on the temperature of plant tissues was tested in Peperomia obtusifolia (A. Dietr.). The plants were kept in a chamber under constant conditions for 24 hr prior to the test. When the plants were thus preincubated in light (12,000 lux) and in low relative humidity there was no increase in the leaf temperature after the relative humidity increased from 10 to 90%. In plants which were maintained in the dark and in high relative humidity prior to the experiment there was a slight increase in leaf temperature with increasing relative humidity, but the temperature was lower than that of the leaves incubated in light prior to the experiment. A temperature increase is a sign of transpiration decrease. The results indicate that during the light period a deficiency in water uptake relative to water utilization developed, so that the transpiration in this case did not depend on the relative humidity but on the amount of water available in the plant, which remains constant despite the humidity increase. The 'dark-adapted' plants maintain a higher transpiration rate (equal lower temperature) which falls somewhat with increasing relative humidity. Another experiment was performed with plants kept in a greenhouse. The temperature increased as a function of sunshine. The same amount of irradiation resulted in a higher temperature increase later in the day, which indicated that the transpiration decreased when the water supply in the leaves decreased. Insufficient water supply is one of the major reasons for low production of organic materials. Transpiration may be decreased by covering the leaves with a water film. In this case temperatures below air temperature may be obtained easily, and the demands for water uptake by the roots is lowered. This increased the production of the plant more than the same volume of water added to the roots. Water uptake by the plants is insufficient in cases of strong irradiation. Efficient limitation of transpiration and need for water uptake is best obtained by reducing leaf temperature.--Copyright 1972, Biological Abstracts, Inc.
W73-03259

A COMPARISON OF LYSIMETER-DERIVED POTENTIAL EVAPOTRANSPIRATION WITH COMPUTED VALUES,
Agricultural Research Service, Coshocton, Ohio.
J. L. McGuinness, and E. F. Bordne.
Available at GPO, Sup Doc, Washington, D. C. 20402 - Price 40 cents. Department of Agriculture Technical Bulletin No 1452, March 1972. 71 p, 5 fig, 3 tab, 53 ref, 2 append.

Descriptors: Evapotranspiration, *Soil moisture, *Data collections, *Methodology, *Lysimeters, Forecasting, Analytical techniques, Curves, Correlation analysis, Soil properties, Climates, Meteorological data, Temperature, Winds, Solar radiation, Agriculture, Crops.
Identifiers: *Potential evapotranspiration.

A 'standard' potential evapotranspiration (PET) curve was derived from measured lysimeter values. Corrections were made for the effects of haycut and less than optimum soil moisture conditions. Thus, the standard PET curve represents the ET that could be obtained with nonlimiting soil and vegetative conditions. Fourteen methods of computing PET daily values were segregated into groups depending upon the climatic inputs required. In the temperature-only-group, the Blaney-Criddle method gave the closest fit to the standard curve. The methods of Thornthwaite, Hamon, and Papadakis gave less satisfactory results. The method of Jensen-Haise was best in the group using temperatures plus solar radiation as input. The methods of Grassi, Stephens-Stewart, Turc, and Makkink were also included in this group. The Christiansen method was the only entry in the group using all available climatic information and provided a good fit to the standard curve. Under combination methods, the U.S. Weather Bureau pan evaporation, the Penman and the van Bavel formulas gave good fits to the standard curve. The USWB lake evaporation method was less satisfactory. Daily and monthly comparisons were made for the entire year and for the April-October growing season. (Woodard-USGS)
W73-03522

THE FOREST RADIATION BUDGET--A REVIEW,
Oregon State Univ., Corvallis, School of Forestry.
L. W. Gay.
Paper presented to the Third Eastern Forest Meteorology Conference, State University of New York, Syracuse, Sept. 13-14, 1971. 15p, 151 ref.

Descriptors: *Forests, *Radiation, Photography, Heat budget, *Energy budget, Ecology, Measurement, *Reviews, Bibliographies, Forest management.

This review is focused on publications that discuss the forest radiation budget and that have appeared within the past five years. The many studies published in this period indicate continued interest in the role of radiation in ecology, and in heat budget studies. Also, there have been improvements in sensors, recorders and measurement techniques.
W73-03654

MOISTURE BALANCE AND DYNAMICS IN 'SUBOR' SANDS (IN RUSSIAN),
A. I. Mikhovich.
Lesovod Agrolesomelior Resp Mezhved Temat Nauchn Sb. 18. p140-149. 1969.
Identifiers: Moisture balance, Moisture, *Pine-G, Sands, *Subor sands, *Transpiration, USSR.

Long-term (1957-1965) hydrological observations in pine 'subor' (a fairly infertile pine site type) of the Donetsk Region were made. The year-to-year differences in transpiration and other water balance features proved insignificant.--Copyright 1972, Biological Abstracts, Inc.
W73-03686

NET PHOTOSYNTHESIS, GROWTH, AND TRANSPIRATION IN AMERICAN ELM SEEDLINGS AS INFLUENCED BY DUTCH ELM DISEASE AND PLANT-WATER STRESS,
Agricultural Research Service, Delaware, Ohio. Plant Science Research Div.
For primary bibliographic entry see Field 02I.
W73-03698

MICROCLIMATE MODIFICATION BY MANIPULATION OF NET RADIATION,
Missouri Univ., Columbia. Dept. of Atmospheric Science.
J. D. Martsolf, and W. L. Decker.
Agricultural Meteorology, Vol 7, No 3, p 197-216, 1970. 10 fig, 3 tab, 12 ref.

Descriptors: *Radiation, *Evaporation, *Evapotranspiration, Atmometers, *Soybeans, Evaporation control.
Identifiers: Net radiation, *Microclimate modification, Vegetative canopy, Louvers, Radiometer.

An argument assuming the shade to be flush with the canopy and based on the alteration of albedo, predicts the reduction in net radiation with increasing shade, both above and below the shade, to be a linear function of the horizontal area shaded. Observations of the effect of a louvered shade on net radiation by tranversing net radiometers beneath the shade, on evaporation by atmometer sampling, on evapotranspiration by a neutron scattering technique and on leaf temperature extremes by thermocouples, were made over and within a soybean canopy. The reduction in net radiation was observed to be directly proportional to the horizontal area shaded. For the case in which two-thirds of the area was shaded, the reduction in atmometer evaporation was over three times as large as the reduction in evapotranspiration and the moderation of average maximum and minimum leaf temperatures was on the order of 5 deg F. Graphical representations of the variations of net radiation with time for the geometri-

cally repeated patterns beneath the louvers suggest a modification of stomatal activity which might explain the great difference between the effect of shade on evaporation and evapotranspiration. (Skogerboe-Colorado State)
W73-03791

EVAPOTRANSPIRATION FROM A SNAP BEAN CROP,
British Columbia Univ., Vancouver. Dept. of Soil Science.
T. A. Black, C. B. Tanner, and W. R. Gardner.
Agronomy Journal, Vol 62, No 2, p 66-69, 1970. 4 fig, 1 tab, 21 ref.

Descriptors: *Transpiration, *Evaporation, Water balance, *Evapotranspiration, Consumptive use, Water loss, *Beans.
Identifiers: Canopy resistance, *Snap beans (Phaseolus vulgaris L.).

A model is described in which transpiration from a loosely structured canopy is calculated from the potential evaporation, the evaporation from the soil, and the stomatal resistance weighted by the leaf area index of the field. Estimation of the evaporation from the soil requires the net radiation at the soil surface and the surface soil water content. A test of the model on snap beans (Phaseolus vulgaris L.) resulted in a 4 percent overestimation attributed to the inaccuracy of the estimate of the evaporation from the soil. (Skogerboe-Colorado State)
W73-03792

EFFECTS OF ROW SPACING ON EVAPOTRANSPIRATION AND YIELDS OF CORN IN A SEMIARID ENVIRONMENT,
Agricultural Research Service, Fort Collins, Colo.
M. L. Fairbourn, W. D. Kemper, and H. R. Gardner.
Agronomy Journal, Vol 62, No 6, p 795-797, 1970. 3 fig, 3 tab, 10 ref.

Descriptors: *Corn (Fields), *Evapotranspiration, Yields, Planting management, *Crop production.
Identifiers: *Row spacing, Microwatershed systems, Semiarid environments, Water use efficiency.

A study was made in 1967 and 1968 on a Nunn clay loam soil to determine the effects of row spacing on evapotranspiration (ET) and yields of corn (Zea mays L.) in a semiarid environment. Double rows 0.3 m apart flanked on each side by spaces 1.8 m wide as used in the microwatershed system were compared with single rows in spacings of 0.9, 1.2, and 1.8 m. ET and yields of the double rows and the single rows of 0.9 and 1.2 m spacings were very similar. These results indicate an important degree of freedom is allowed in planning management systems such as microwatersheds to increase water use efficiency. (Skogerboe-Colorado State)
W73-03793

THE EVAPORATION FROM A SWAMP,
Macquarie Univ., North Ryde (Australia). School of Earth Sciences.
E. T. Linacre, B. B. Hicks, G. R. Sainty, and G. Grauze.
Agricultural Meteorology, Vol 7, No 5, p 375-386, 1970. 4 tab, 22 ref.

Descriptors: *Evaporation, Measurement, *Swamps, *Australia.
Identifiers: *Swamp evaporation, *Barren Box Swamp (Aust), Reeds.

The evaporation from an Australian swamp of area 3,000 ha has been measured over several daylight 1/2-h periods during three days in summer, at the same time as measurements of the evaporation from a lake 16 km away. The swamp evaporation was determined using an eddy-correlation instrument. This was used also in preliminary measurements at the lake, to verify the appropriate constant in a 'bulk property'-formula for lake evaporation, enabling estimates to be made of the latter from measurements of wind travel, dry- and wet-bulb temperatures, and water surface temperature. The results suggest that, except immediately after rain, the swamp lost water at a rate significantly lower than the lake. This is attributed to the lower albedo of the clear water surface of the lake, the shelter given by the reeds in the swamp to the water surface and the internal resistance to water movement of the reeds themselves. (Skogerboe-Colorado State)
W73-03794

2E. Streamflow and Runoff

A PHYSICS-BASED APPROACH TO HYDROLOGIC RESPONSE MODELING. PHASE I: MODEL DEVELOPMENT,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 02A.
W73-03257

METHODS FOR ROUTING HYDROGRAPHS THROUGH OPEN CHANNELS,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 08B.
W73-03263

WATER RESOURCES DATA FOR TEXAS, 1971: PART 1. SURFACE-WATER RECORDS.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W73-03294

FLOOD OF OCTOBER 5-10, 1970 IN PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
W. J. Haire.
Commonwealth of Puerto Rico Water-Resources Bulletin 12, 1972. 42 p, 34 fig, 13 photo, 5 tab, 9 ref.

Descriptors: *Floods, *Streamflow, *Sediment transport, *Water quality, *Puerto Rico, Rainfall-runoff relationships, Gaging stations, Peak discharge, Flow rates, Storms, Data collections, Hydrologic data, Flood damage, Flood recurrence interval, Frequency, Historic floods, Chemical analysis, Specific conductivity, Nitrates, Silica, Correlation analysis.
Identifiers: *Arecibo (P.R.), *Ponce (P.R.).

The storm of October 5-10, 1970, caused floods of historical significance in the eastern two-thirds of Puerto Rico. More than 38 inches of rain fell in parts of the 2,000 square-mile area east of a line from Arecibo to Ponce. The peak discharge at 11 gaging stations equaled or exceeded a 50-year recurrence interval, and at one site the maximum discharge was 1.89 times as great as that of a 50-year flood. Discharge rates of several streams were more than 3,000 cubic feet per second per square mile. Three significant findings suggest that tropical weathering processes provide large amounts of material for transport by suspension and solution: (a) Specific conductances remained relatively high throughout the high-flow period. For example, on one stream the flood flow was approximately 1,300 times greater than low flow, whereas the specific conductance was reduced only to about one-third that of low flow. (b) Nitrate concentrations increased with streamflow and remained at or near constant levels throughout the flood. (c) Silica, which is relatively insoluble, was never reduced in concentration by more than half during the high-runoff period. (Woodard-USGS)
W73-03413

DETERMINATION OF CHANNEL CAPACITY OF THE MOKELUMNE RIVER DOWNSTREAM FROM CAMANCHE DAM, SAN JOAQUIN AND SACRAMENTO COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 08B.
W73-03414

SUBSURFACE-FLOW INVESTIGATIONS (ISSLEDOVANIYA PODZEMNOGO STOKA).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W73-03525

ESTIMATES OF STREAMFLOW VARIABILITY AND GROUNDWATER REPLENISHMENT IN REGIONS OF INTENSIVE GROUNDWATER MINING (OTSENKA IZMENENIY STOKA REK I VOSPOLNENIYA ZAPASOV PODZEMNYKH VOD V RAYONAKH INTENSIVNOY EKSPLUATATSII POSLEDNIKH),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W73-03529

ANALYSIS OF HYDROGRAPHS OF STREAMFLOW AND RECHARGE CAUSED BY AUFEIS (ANALIZ GIDROGRAFOV NALEDNOGO PITANIYA I STOKA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W73-03530

CALCULATED MINIMUM WATER DISCHARGES (RASCHETNYYE MINIMAL'NYYE RASKHODY VODY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. M. Vladimirov.
In: Issledovaniya podzemnogo stoka; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 188, Leningrad, p 244-272, 1972. 11 fig, 4 tab, 5 ref.

Descriptors: *Discharge (Water), *Discharge frequency, *Discharge measurement, *Low flow, *Runoff, Rivers, Streams, Watersheds (Basins), Mathematical studies, Probability, Variability, Seasonal, Monthly, Maps, Equations.
Identifiers: *USSR, *Minimum flow, Isograms, Skewness.

Methods are presented for determining 30-day and average daily discharges of different probability for ungaged rivers in the USSR. To determine minimum 30-day runoff, isogram maps constructed for a runoff of 80% probability and conversion factors to other probabilities are used. Minimum 30-day runoff of small streams is calculated with an 80% probability from an empirical relation based on minimum average long-term 30-day discharges and basin areas. Minimum average daily discharges of 80% probability are determined on the basis of their relation to minimum 30-day discharges. Minimum discharges of 75%-97% probability can be computed from a runoff of 80% probability. (See also W73-03525) (Josefson-USGS)
W73-03532

MINIMUM RIVER FLOW IN THE CAUCASUS (MINIMAL'NYY STOK REK KAVKAZA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. M. Vladimirov, and G. N. Khmaladze.
In: Issledovaniya podzemnogo stoka; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 188, Leningrad, p 273-282, 1972. 3 fig, 1 tab, 6 ref.

Descriptors: *Low flow, *Low-flow frequency, *Average flow, *Discharge (Water), *Runoff,

Rivers, Mountains, Elevation, Seasonal, Monthly, Probability, Maps.
Identifiers: *USSR, *Caucasus, *Mininum flow, Isograms.

Methods are presented for determining minimum average monthly and average daily discharges of different probability for ungaged rivers in the Caucasus. Isogram maps are used to determine long-term minimum average monthly flow and average monthly flow of 80% probability. Minimum flow of different probabilities is computed on the basis of a runoff of 80% probability. Minimum average daily discharges are determined from their relation to minimum average monthly discharge. Highest minimum runoff values (40-50 liter/sec/sq km) are observed in summer and fall in the high mountain zone of the Greater Caucasus. High minimum monthly runoff values (up to 30 liter/sec/sq km) are observed in summer and fall on rivers of the Kolkhida Lowland. Lowest minimum runoff (less than 1 liter/sec/sq km) occurs during this period in foothills of the Northern Caucasus and in lower reaches of the Kura River basin. A sharp decrease in long-term minimum average monthly flow is observed south and southeast of the main Caucasus range and Black Sea coast. (See also W73-03525) (Josefson-USGS)
W73-03533

MINIMUM FLOW OF MOUNTAIN STREAMS IN SOVIET CENTRAL ASIA (MINIMAL'NYY STOK GORNYKH REK SREDNEY AZII),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. Z. Amus'ya.
In: Issledovaniya podzemnogo stoka; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 188, Leningrad, p 283-304, 1972. 8 fig, 2 tab, 5 ref.

Descriptors: *Low flow, *Low-flow frequency, *Discharge (Water), *Runoff, *Streams, Mountains, Elevation, Altitude, Geomorphology, Climatology, Meteorology, Hydrogeology, Subsurface flow, Probability, Variability, Seasonal, Monthly, Hydrographs, Maps.
Identifiers: *USSR, *Soviet Central Asia, *Minimum flow, Isograms.

Studies were made of minimum flow of mountain streams in Sovient Central Asia for cold and warm periods of the year. On the basis of altitude and isogram maps for ungaged rivers in 22 mountainous regions, a relation was established between minimum 30-day runoff of 80% probability and average basin elevation. Coefficients are given for converting 30-day minimum runoff of 80% probability to both daily minimum discharges of 80% probability and to monthly minimum runoff of 75%-97% probability. (See also W73-03525) (Josefson-USGS)
W73-03534

EFFECT OF LAKES ON MINIMUM STREAMFLOW IN WEST SIBERIA (VLIYANIYE OZER NA MINIMAL'NYY STOK REK ZAPADNOY SIBIRI),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
V. P. Gerasimenko.
In: Issledovaniya podzemnogo stoka; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 188, Leningrad, p 305-311, 1972. 1 fig, 2 tab, 13 ref.

Descriptors: *Lakes, *Streamflow, *Low flow, *Runoff, Rivers, Watersheds (Basins), Groundwater, Infiltration, Seasonal, Correlation analysis, Regression analysis, Equations.
Identifiers: *USSR, *West Siberia, *Ob River.

Investigations of the role of lakes in formation of minimum streamflow were based on observations of runoff of 34 rivers in the Middle and Lower Ob River basin and Pur region in West Siberia. The negligible effect of lakes on minimum winter and summer streamflow is attributed to (1) location of a large number of lakes in extreme upper reaches of rivers; (2) absence of an outlet on the majority of lakes; and (3) small infiltration to groundwater reservoirs from lakes of small storage capacity. Equations are developed to determine winter minimum river flow in the area. (See also W73-03525) (Josefson-USGS)
W73-03535

WATERSHEDS IN TRANSITION.
For primary bibliographic entry see Field 04C.
W73-03536

A METHODOLOGY FOR WATERSHED EVALUATION,
State Univ., of New York, Binghamton. Dept. of Geology.
For primary bibliographic entry see Field 02A.
W73-03542

A SIMPLIFIED APPROACH TO PREDICT SURFACE RUNOFF AND WATER LOSS HYDROGRAPHS,
Central and Southern Florida Flood Control District, West Palm Beach.
L. K. Sinha.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 159-165, 1972. 5 fig, 4 tab, 17 ref.

Descriptors: *Mathematical models, *Runoff, *Water loss, *Hydrographs, *Forecasting, Watersheds (Basins), Data collections, Hydrologic data, Stream gages, Correlation analysis, Methodology, Rainfall-runoff relationships, Model studies.
Identifiers: *Ground cover effects.

A generalized mathematical model with three parameters, P, A and B, has been developed to predict surface runoff and water loss hydrographs from gaged and ungaged watersheds. The parameter P, found to be the most important by sensitivity analysis, was correlated to rainfall and watershed characteristics and time of the year in a Fourier series expression with four terms. The parameter A, second in order of importance, was correlated to rainfall hyetograph charcteristics and watershed area. The parameter B is expressed as a function of A in a fifth order polynomial based upon Legendre approximation. The surface runoff hydrographs obtained by using the model approximated very well the observed surface runoff hydrographs consisting of one, two, and more than two peaks. Thirty surface runoff-producing rainfalls on 14 small watersheds varying in area between 0.0025 and 7.1563 square miles were selected. Twelve of the 14 watersheds were located at Cochocton, Ohio; one was located at Watkinsville, Georgia; and one was located at LaCrosse, Wisconsin. Rainfall and runoff values were tabulated at two-minute intervals. The base flow involved in any of the selected hydrographs was negligible. (See also W73-03536) (Woodard-USGS)
W73-03543

EFFECT OF AN ASPEN CLEARCUTTING ON WATER YIELD AND QUALITY IN NORTHERN MINNESOTA,
Forest Service (USDA), Grand Rapids, Minn. Northern Conifers Lab.
For primary bibliographic entry see Field 04C.
W73-03547

THE INFLUENCE OF PERCENTAGE FOREST ON DESIGN FLOODS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04C.
W73-03552

THE ROLE OF HYDROLOGIC PROPERTIES OF THE FOREST FLOOR IN WATERSHED HYDROLOGY,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 04C.
W73-03553

STRIP-MINING INCREASES FLOOD POTENTIAL OF MOUNTAIN WATERSHEDS,
Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 04C.
W73-03554

DEEP SEEPAGE MANAGEMENT ON HEADWATER KARST WATERSHEDS,
Missouri Univ., Columbia. School of Forestry.
For primary bibliographic entry see Field 04C.
W73-03555

WATERSHEDS IN THE RURAL-URBAN FRINGE,
Indiana Univ., Bloomington. Dept. of Geography.
For primary bibliographic entry see Field 04C.
W73-03556

HYDROLOGY--FULTON COUNTY, NEW YORK,
Fulton County Planning Dept., Johnstown, N.Y.
For primary bibliographic entry see Field 07C.
W73-03736

STRUCTURAL ANALYSIS OF HYDROLOGIC TIME SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-03738

LOW FLOWS AND TEMPERATURES OF STREAMS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 04C.
W73-03739

MORPHOMETRY OF THREE SMALL WATERSHEDS, BLACK HILLS, SOUTH DAKOTA, AND SOME HYDROLOGIC IMPLICATIONS,
Forest Service (USDA) Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02A.
W73-03744

STREAMFLOW COMPUTATIONS AND FORECASTS (RASCHETY I PROGNOZY STOKA REK).
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 04A.
W73-03747

FORECAST OF A STORM-FLOOD HYDROGRAPH FOR RIVERS OF EASTERN TRANSBAYKAL BASED ON PRECIPITATION AND RUNOFF (PROGNOZ GIDROGRAFA DOZHDEVYKH PAVODKOV REK VOSTOCHNOGO ZABAYKAL'YA NA OSNOVE KOMPLEKSNOGO UCHETA SUMMARNOGO PRITOKA V RUSLOVUYU SET' I OSADKOV),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 04A.
W73-03748

TECHNIQUES FOR FORECASTING PRESPRING MINIMUM WATER LEVELS OF THE AMUR RIVER (PREDVESENNIYE MINIMAL'NYYE UROVNI VODY R. AMURA I METODIKA IKH PROGNOZIROVANIYA),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 04A.
W73-03750

USE OF CORRECTION TO COMPUTE MAXIMUM STORM-FLOOD DISCHARGES ON RIVERS IN THE SOUTHERN PART OF THE SOVIET FAR EAST (OTSENKA RASCHETOV MAKSIMAL'NYKH RASKHODOV DOZHDEVYKH PAVODKOV NA REKAKH YUGA DAL'NEGO VOSTOKA PO METODU KORREKTS II),
Far Eastern Hydrometeorological Research Inst., Valadivostok (USSR).
For primary bibliographic entry see Field 04A.
W73-03751

CHARACTERISTICS OF MINIMUM SUMMER--FALL FLOW ON RIVERS IN THE LAKE KHANKA BASIN (NEKOTORYYE OSOBENNOSTI FORMIROVANIYA MINIMAL'-NOGO LENTNE-OSENNEGO STOKA NA REKAKH BASSEYNA OZ. KHANKA),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 04A.
W73-03752

RELATION OF MINIMUM WINTER RIVER FLOW IN THE UPPER YENISEY BASIN TO AVERAGE BASIN ELEVATION (SYAZ'-MINIMAL'NOGO ZIMNEGO STOKA REK BASSEYNA VERKHNEGO YENISEYA SO SREDNEY VYSOTOY VODOSBORA),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 04A.
W73-03753

2F. Groundwater

A PHYSICS-BASED APPROACH TO HYDROLOGIC RESPONSE MODELING. PHASE I: MODEL DEVELOPMENT,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 02A.
W73-03257

GROUNDWATER RESERVOIR RESPONSE TO EARTH TIDES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Geological Science.
E. S. Robinson, and R. T. Bell.
Available from the National Technical Information Service as PB-213 845, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report, June 1970. 5 p, 3 ref. OWRR A-023-VA (1).

Descriptors: *Tides, *Aquifers, *Wells, *Virginia, Porosity, Specific storage.

The response of a confined well-aquifer system to tidal dilatations requires consideration of the earth tidal dilatation and the ocean tide dilatation. For wells located near the ocean the explanation of tides requires analysis of at least two tidal harmonic constituents and the ratio of the heights of the corresponding ocean tide constituents. The magnitudes of the ocean tide dilatations can be eliminated in solving the simultaneous equations, but their ratio must be known. Tides observed in ten wells in Virginia were satisfactorily explained using modifications of the equations, observed barometric and ocean tide data, and reasonable values for the porosity and bulk modulus of the aquifer system. Calculation of aquifer porosity from well tide analysis is restricted by uncertainty about bulk modulus and ocean loading effects. If a well-aquifer system is located far enough inland so that ocean tide effects can be neglected, porosity values can be obtained to an accuracy subjectively estimated at plus or minus 5 percentage points. Specific storage capacity of a well aquifer system can be more accurately calculated than porosity because independent estimates of aquifer bulk modulus are not required.
W73-03271

CALCULATION OF COMPONENTS IN THE GROUNDWATER BALANCE (RASCHETY ELEMENTOV BALANSA GRUNTOVYKH VOD),
I. B. Wolftzoun.
Gidrometeoizdat, Leningrad, 1972. 272 p.

Descriptors: *Hydrogeology, *Groundwater, *Groundwater movement, *Groundwater recharge, *Water balance, Water table, Water level fluctuations, Water yield, Infiltration, Evaporation, Rainfall-runoff relationships, Surface-groundwater relationships, Aquifers, Transmissivity, Soil moisture, Zone of aeration, Snowmelt, Meteorology, Analytical techniques, Seasonal.
Identifiers: USSR, Water-balance equation, Chronoisopleths.

The development of techniques for calculating components in the groundwater balance, based on extensive use of hydrometeorological data is discussed. Methods include calculation of groundwater-level fluctuations during different seasons of the year; calculation of components in the groundwater balance for individual slopes; quantitative estimates of recharge from streamflow and the groundwater contribution to surface flow; and calculation of average groundwater recharge direct from precipitation and by infiltration of surface water. (Josefson-USGS)
W73-03295

QUANTITATIVE ESTIMATES OF GROUNDWATER RECHARGE IN THE NORTHERN PRIPYAT' POLES'YE (KOLICHESTVENNAYA OTSENKA PITANIYA GRUNTOVYKH VOD V SEVERNOY CHASTI PRIPYATSKOGO POLES'YA),
Akademiya Navuk BSSR, Minsk. Institut Geokhimii i Geofiziki.
M. F. Kozlov, and Ya. M. Shilinskaya.
Izdatel'stvo 'Nauka i Tekhnika', Minsk, 1972. 96 p.

Descriptors: *Hydrogeology, *Groundwater, *Groundwater recharge, *Estimating, Precipitation (Atmospheric), Infiltration, Evaporation, Water balance, Water table, Water levels, Water level fluctuations, Water storage, Soil moisture, Zone of aeration, Capillary fringe, Temperature, Variability, Analytical techniques, Water year, Seasonal.
Identifiers: *USSR, *Belorussia, *Poles'ye Region, *Pripyat' River, *Groundwater resource evaluation, Isopleths, Thermoisopleths.

Quantitative estimates of groundwater recharge and analysis of its variations in time were based on observations of water-table fluctuations and soil moisture in the zone of aeration in the Moroch' - Sluch' interfluve in the Belorussian northern Pripyat' Poles'ye Region during the period October 1959-December 1965. In the fall (October-November), total infiltration was 45.6-58.4 mm, evaporation was 19.1-30.2 mm, and net average infiltration was 26.5-28.2 mm, or 30.9%-32.3% of total seasonal precipitation. During winter months (December-February), evaporation varied between 45.5 and 58.9 mm, and average infiltration varied between 37.5 and 39.4 mm. During spring (March-April), evaporation was only 13.6-14.1 mm, and average infiltration was 138.2-140.0 mm. During summer months (May-September), evaporation was 117.7-122.4 mm, and average infiltration was 74.7-114.1 mm. Evaporation during the period of study was 214.9-225.6 mm, and average infiltration was 297.8-350.2 mm, or 56.7%-66.4% of total annual precipitation. The estimated values can be used in groundwater resource evaluation and in forecasting changes in groundwater levels resulting from drainage improvement and other hydrogeological and water-management measures. (Josefson-USGS)
W73-03296

GEOLOGY OF THE MIDDLETOWN-ODESSA AREA, DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 07C.
W73-03403

GEOLOGY OF THE CHESAPEAKE AND DELAWARE CANAL AREA, DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 07C.
W73-03404

PALEOTEMPERATURES AND OTHER HYDROLOGICAL PARAMETERS DEDUCED FROM NOBLE GASES DISSOLVED IN GROUNDWATERS; JORDAN RIFT VALLEY, ISRAEL,
Israel Atomic Energy Commission, Rehovoth; and Weizmann Inst. of Science, Rehovoth (Israel).
For primary bibliographic entry see Field 02K.
W73-03412

GEOCHEMICAL SURVEY OF WATER,
Geological Survey, Rolla, Mo.
For primary bibliographic entry see Field 02K.
W73-03418

GEOTHERMAL OVERVIEWS OF THE WESTERN UNITED STATES, 1972.
Geothermal Resources Council, Davis, Calif.
For primary bibliographic entry see Field 03B.
W73-03419

OVERVIEW OF GEOTHERMAL RESOURCES POTENTIAL IN ARIZONA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 03B.
W73-03420

GEOTHERMAL RESOURCES IN CALIFORNIA,
California State Div. of Oil and Gas, Sacramento.
For primary bibliographic entry see Field 03B.
W73-03421

GEOTHERMAL RESOURCES OF COLORADO--A SUMMARY,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 03B.
W73-03423

HAWAII OVERVIEW,
Hawaii Univ., Honolulu. Center for Engineering Research.
For primary bibliographic entry see Field 03B.
W73-03424

GEOTHERMAL RESOURCES OF IDAHO,
Boise State Coll., Idaho.
For primary bibliographic entry see Field 03B.
W73-03425

POTENTIAL GEOTHERMAL RESOURCES IN MONTANA,
Montana Bureau of Mines and Geology, Billings.
For primary bibliographic entry see Field 01A.
W73-03426

GEOTHERMAL PROSPECTS IN NEW MEXICO,
New Mexico Bureau of Mines and Mineral Resources.
For primary bibliographic entry see Field 03B.
W73-03428

GEOTHERMAL OVERVIEW OF OREGON,
Oregon State Dept. of Geology and Mineral Industries, Portland.
For primary bibliographic entry see Field 03B.
W73-03429

UTAH'S GEOTHERMAL RESOURCES, LOCATION, POTENTIAL, AND ADMINISTRATIVE AGENCIES,
Utah Geological and Mineralogical Survey, Salt Lake City.
For primary bibliographic entry see Field 03B.
W73-03430

GEOTHERMAL ENERGYIN WASHINGTON,
Wshington Dept. of Natural Resources, Olympia. Div. of Mines and Geology.
For primary bibliographic entry see Field 03B.
W73-03431

FALLOW AND GRAVEL MULCH EFFECTS ON SOIL WATER STORAGE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 04B.
W73-03521

A SURVEY OF THE SUBSURFACE SALINE WATER OF TEXAS, VOLUME I,
Core Labs., Inc., Dallas, Tex.
For primary bibliographic entry see Field 07C.
W73-03524

SUBSURFACE-FLOW INVESTIGATIONS (ISSLEDOVANIYA PODZEMNOGO STOKA).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 188, Leningrad, O. V. Popov, editor, 1972. 319 p.

Descriptors: *Hydrogeology, *Subsurface flow, *Surface-groundwater relationships, *Groundwater, *Groundwater movement, Groundwater recharge, Groundwater mining, Rainfall-runoff relationships, Runoff, Streamflow, Low flow, Lakes, Water types, Hydrograph analysis, Model studies, Mathematical studies, Statistical methods, Probability, Equations, Mapping.
Identifiers: *USSR, *Minimum flow, *Aufeis, *Hydrometric stations, Correlation coefficients, Isograms.

This collection of 19 papers is devoted to study of subsurface flow, surface-groundwater relationships, and minimum streamflow discharges. Individual topics include: (1) cyclic fluctuations and seasonal distribution of groundwater flow into streams in the European USSR; (2) estimates of streamflow variability and groundwater replenishment in regions of intensive groundwater mining; (3) contribution of artesian water to streams; (4) analysis of hydrographs of streamflow and recharge caused by aufeis; (5) characteristics of groundwater in the Armenian Republic; (6) hydrodynamic structure of the sea bottom of the Gulf of Riga; (7) analog models for studying surface-groundwater relationships; (8) minimum river flow in the Caucasus; (9) minimum flow of mountain streams in Soviet Central Asia; and (10) effect of lakes on minimum streamflow in West Siberia. (See W73-03526 thru W73-03535) (Josefson-USGS)
W73-03525

PRACTICAL PROBLEMS IN THE STUDY OF SURFACE-GROUNDWATER RELATIONSHIPS (PRAKTICHESKIYE ZADACHI V PROBLEME IZUCHENIYA VZAIMODEYSTVIYA POVERKHNOSTNYKH I PODZEMNYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
O. V. Popov.
In: Issledovaniya podzemnogo stoka; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 188, Leningrad, p 5-22, 1972. 20 ref.

Descriptors: *Hydrology, *Hydrogeology, *Surface-groundwater relationships, *Subsurface flow, *Water resources, Water balance, Water utilization, Water conservation, Water supply, Recharge, Streamflow, Runoff, Irrigation, Drainage, Karst, River basins, Forest management, Estimating, Mapping, Variability.
Identifiers: *USSR, Hydrometric stations.

Rapid growth of the national economy and broad organizational and legislative measures to ensure optimal utilization and conservation of water resources have altered the natural water regime of river basins in the USSR. Investigations of the effects of economic activities on water balance of river basins call for quantitative estimates of possible changes in water resources resulting from streamflow regulation, groundwater mining, irrigation, drainage, and forest improvement. (See also W73-03525) (Josefson-USGS)
W73-03526

CYCLIC FLUCTUATIONS OF GROUNDWATER FLOW INTO STREAMS IN THE EUROPEAN USSR (TSIKLICHESKIYE KOLEBANIYA PODZEMNOGO STOKA V REKI YETS),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
B. M. Dobroumov.
In: Issledovaniya podzemnogo stoka; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 188, Leningrad, p 23-70, 1972. 12 fig, 8 tab, 26 ref, 3 append.

Descriptors: *Subsurface flow, *Groundwater movement, *Fluctuations, *Streams, Gaging stations, Streamflow, Runoff, Geology, Hydrogeology, Geomorphology, Physiographic provinces, Climatology, Mathematical studies, Statistical methods, Correlation analysis, Time series analysis, Probability, Stochastic processes, Equations, Maps.
Identifiers: *European USSR, Hydrometric stations.

Investigations of long-term fluctuations of groundwater flow into streams in the European USSR were based on data of 57 gaging stations with periods of record ranging from 34 to 89 years. The rate of groundwater flow varied between 0.18 and 6.62 liter/sec/sq km, which corresponds to a runoff depth of 3 to 208 mm. Statistical criteria were used to establish the 'nonrandom' character of alternating high- and low-water years, and curves were constructed for 37 gaging stations for 1926-65 to analyze basic zonal and intrazonal patterns of change in the quantitative indices of individual runoff phases. Decomposition of time series into random and nonrandom components was used for analysis of secular cyclic fluctuations of groundwater flow into streams. On the basis of the cophasal character of cyclic fluctuations, the European part of Soviet Russia was divided into regions and subregions. (See also W73-03525) (Josefson-USGS)
W73-03527

SEASONAL DISTRIBUTION OF GROUNDWATER FLOW INTO STREAMS IN THE EUROPEAN USSR (VNUTRIGODOVOYE RASPREDELENIYE PODZEMNOGO STOKA V REKI YETS),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
T. M. Chernaya.
In: Issledovaniya podzemnogo stoka; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 188, Leningrad, p 71-85, 1972. 10 fig, 1 tab, 10 ref.

Descriptors: *Subsurface flow, *Subsurface runoff, *Groundwater movement, *Distribution patterns, *Seasonal, Annual, Rainfall-runoff relationships, Streams, Rivers, Hydrogeology, Geomorphology, Orography, Mapping, Maps.
Identifiers: *European USSR, Isograms.

Investigations of seasonal distribution of groundwater flow were based on small-scale (1:5,000,000) mapping of 365 sampling points in the East European Plain, Carpathians, and on the western slope of the Middle Urals for spring, summer-fall, and winter periods. Seasonal distribution of groundwater flow, computed for 28 mountain streams in the Caucasus, was tabulated. The relation of seasonal groundwater flow to annual values can be used to determine seasonal values of groundwater flow to ungaged rivers. (See also W73-03525) (Josefson-USGS)
W73-03528

ESTIMATES OF STREAMFLOW VARIABILITY AND GROUNDWATER REPLENISHMENT IN REGIONS OF INTENSIVE GROUNDWATER MINING (OTSENKA IZMENENIY STOKA REK I VOSPOLNENIYA ZAPASOV PODZEMNYKH VOD V RAYONAKH INTENSIVNOY EKSPLUATATSII POSLEDNIKH),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
B. S. Ustyuzhanin.
In: Issledovaniya podzemnogo stoka; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 188, Leningrad, p 86-104, 1972. 6 fig, 5 tab, 12 ref.

Descriptors: *Estimating, *Streamflow, *Surface-groundwater relationships, *Groundwater recharge, *Groundwater mining, Hydrogeology, Aquifers, Subsurface flow, Pumping, Drawdown, Water loss, Infiltration, Rainfall-runoff relationships, Correlation analysis, Variability.
Identifiers: *USSR, *Moscow Oblast, Polya River.

Changes in streamflow resulting from exploitation of groundwater by prolonged pumping were investigated in the Polya River basin in Moscow Oblast. Decrease in runoff of the Polya River during the period of observations (1933-48) averaged 19 mm/yr or slightly more than 12% of average annual runoff. Total groundwater recharge and reduction of runoff as averaged for 1933-48 (0.61 liter/sec/sq km), assumed for 1946-48 (0.41 liter/sec/sq km), and measured for 1968-69 (0.51 liter/sec/sq km) were comparable. A hydrologic method is presented for assessing replenishment of groundwater storage in aquifers on the basis of streamflow losses. (See also W73-03525) (Josefson-USGS)
W73-03529

ANALYSIS OF HYDROGRAPHS OF STREAMFLOW AND RECHARGE CAUSED BY AUFEIS (ANALIZ GIDROGRAFOV NALEDNOGO PITANIYA I STOKA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
B. L. Sokolov.
In: Issledovaniya podzemnogo stoka; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 188, Leningrad, p 130-152, 1972. 5 fig, 10 tab, 5 ref.

Descriptors: *Hydrographs, *Hydrograph analysis, *Streamflow, *Recharge, *Ice, Groundwater, Melt water, Melting, Air temperature, Seasonal, Rivers, River basins, Variability, Equations.
Identifiers: *USSR, *Yakutski ASSR, *Aufeis.

Basic characteristics of streamflow hydrographs and hydrographs of water yield to streams from aufeis for 11 rivers in the Yana, Indigirka, and Kolyma basins in northern Yakutsk ASSR were investigated. The rate of aufeis melt-water inflow into streams depends upon rate of thawing of ice from the water surface, changes in aufeis area, and areal distribution of aufeis in the basin. Shape of the melt-water hydrograph is determined by air temperatures in winter and by amount of groundwater storage available for aufeis formation. The results obtained can be used to compute streamflow and the contribution of aufeis to basin yield for other rivers under similar physiographic conditions. (See also W73-03525) (Josefson-USGS)
W73-03530

CHARACTERISTICS OF GROUNDWATER IN THE ARMENIAN SSR (NEKOTORYYE OSOBENNOSTI REZHIMA PODZEMNYKH VOD ARMYANSKOY SSR),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
S. M.Musayelyan.
In: Issledovaniya podzemnogo stoka; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 188, Leningrad, p 193-209, 1972. 14 fig, 4 tab, 7 ref.

Descriptors: *Hydrogeology, *Groundwater, *Water types, Confined water, Connate water, Pore water, Water table, Discharge (Water), Rainfall-runoff relationships, Rocks, Aquifers, Springs, Wells, Elevation, Geologic time, Variability, Seasonal, Annual.
Identifiers: *USSR, *Armenian SSR, Groundwater occurrence, Correlation coefficients, Autocorrelation.

Depending upon occurrence and movement, groundwater in the Armenian Republic is divided into artesian water and into four types of unconfined water: (1) interstitial, interstitial-stratal, or interstitial-karst water of sedimentary rocks; (2) interstitial water of the weathering crust of volcanic-sedimentary and intrusive rocks; (3) interstitial-pore water of Miocene-Pliocene and Quaternary lava formations; and (4) pore water of loose, fragmental alluvium, alluvial fans, and glacial deposits. Groundwater occurs in the Dzhavakhetskoye and Zangezuro-Karabakhskoye Uplands; the Murguz, Gegam, Vardenis, and Tsakhkunyats ranges; and Aragats mountain chain. Artesian water occurs only in upper horizons of Pliocene-Quaternary deposits of the Ararat, Mazra, Leninakan, Nalband, and Sisian depressions. According to 1967 figures, there are 65 artesian wells and 30 springs in the Ararat Valley; 8 springs on the eastern and western slopes of the Dzhavakhetskoye Upland; 30 springs in the Aragats Mountains; 52 springs in the Gegam range; 30 springs in the Vardenis range; 36 springs in the Zangezuro-Karabakhskoye Upland; and 15 wells in the Mazra plain. Graphs show the relation of spring discharge to both well discharge and elevation, and a tabulation is made of monthly discharges of the Nazrevan Spring for 1948-67. (See also W73-03525) (Josefson-USGS)
W73-03531

CALCULATED MINIMUM WATER DISCHARGES (RASCHETNYYE MINIMAL'NYYE RASKHODY VODY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W73-03532

MINIMUM RIVER FLOW IN THE CAUCASUS (MINIMAL'NYY STOK REK KAVKAZA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W73-03533

MINIMUM FLOW OF MOUNTAIN STREAMS IN SOVIET CENTRAL ASIA (MINIMAL'NYY STOK GORNYKH REK SREDNEY AZII),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W73-03534

EFFECT OF LAKES ON MINIMUM STREAMFLOW IN WEST SIBERIA (VLIYANIYE OZER NA MINIMAL'NYY STOK REK ZAPADNOY SIBIRI),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W73-03535

MUNICIPAL WATER SUPPLIES AND USES, NORTHWESTERN NEW MEXICO,
For primary bibliographic entry see Field 06D.
W73-03641

GROUNDWATER IN MONTANA.
Montana Water Resources Board, Helena.
For primary bibliographic entry see Field 04B.
W73-03644

MONTANA WATER RESOURCES AND PLANNING.
Montana Water Resources Board, Helena.
For primary bibliographic entry see Field 06A.
W73-03645

MATHEMATICAL MODEL OF LEAKY AQUIFER,
Colorado State Univ., Fort Collins.
R. Bibby, and D. K. Sunada.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97, No IR3, Paper 8350, p 387-395, 1971. 1 tab, 5 fig, 9 ref, 2 append.

Descriptors: *Aquifers, Drainage, *Leakage, *Mathematical models, Groundwater, Numerical analysis, *Colorado.
Identifiers: *Kiowa-Bijou basin (Colo).

A technique is described to determine the direction and volume of leakage between a confined aquifer and an overlying unconfined aquifer. The technique involves the numerical modeling of only the unconfined aquifer, so that data are required on only this aquifer. The predicted values of water table elevation obtained from the numerical model are compared to known values. From discrepancies between these values, inferences can be made on the direction and volume of leakage. The results of the application of the technique in the Kiowa-Bijou basin of Colorado are given. Even with poor input data to the model the results obtained on the direction of leakage are good, but the accuracy of the estimate of the volume of leakage depends more on the accuracy of the input data. (Skogerboe-Colorado State)
W73-03795

IGNEOUS AND METAMORPHIC ROCKS,
Geological Survey, Washington, D.C.
H. E. Thomas.
In: Proceedings of the National Symposium on Ground Water Hydrology, American Water Resources Association, p 103-106, November 1967. 6 ref.

Descriptors: *Igneous rocks, *Metamorphic rocks, Groundwater, *Groundwater availability, Geologic control, Hydraulic gradient, Weathering, Springs, Basalts, Water supply.

Water in igneous and metamorphic rocks which are no longer subjected to heat and pressure of origin is considered. A significant contrast is noted between ground water reservoirs in sediments and sedimentary rocks and those in intrusive and metamorphic rocks. Sediments originate in a watery environment and have homogeneous primary permeability over extensive areas, which may decrease with consolidation. Crystalline rocks originate with minimum water and permeability. In some cases the heterogeneous pattern of permeability may be used to advantage. Yield of wells in igneous and metamorphic rock terranes is characteristically smaller than in sedimentary areas. (Smith-NWWA)
W73-03830

GROUND WATER HYDRAULICS AS A GEOPHYSICAL AID,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 08F.
W73-03832

GROUND WATER, A SELECTED BIBLIOGRAPHY,
Geraghty and Miller, Port Washington, N.Y.
F. van der Leeden.
Water Information Center, Inc., Port Washington, New York, 1971. 116 p, 1500 ref.

Descriptors: *Groundwater, *Bibliographies, Logging (Recording), Water quality, *Data collections, Exploration History, Hydraulics, *Aquifer characteristics, Chemical analysis, Pump testing, Groundwater movement, Pollutants, Radioactivity, Saline water intrusion, Well data, Artificial recharge.
Identifiers: Subsurface disposal.

This book has been written to fill the need for a selected bibliographic reference to publications in the ground water field. Most papers concerning local hydrogeologic conditions have been omitted, except in certain cases where the contents were considered to be of more encompassing value. The approximately 1,500 references have been listed under 32 topics, each dealing with a particular aspect of the field of ground water hydrology. Each reference is listed only once, alphabetically by author. References that are themselves bibliographies dealing with specific topics such as artificial recharge, water law, etc., are listed under those headings. A section for general bibliographies is also included. (Campbell-NWWA)
W73-03850

2G. Water in Soils

A PHYSICS-BASED APPROACH TO HYDROLOGIC RESPONSE MODELING. PHASE I: MODEL DEVELOPMENT,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 02A.
W73-03257

QUANTITATIVE ESTIMATES OF GROUNDWATER RECHARGE IN THE NORTHERN PRIPYAT' POLES'YE (KOLICHESTVENNAYA OTSENKA PITANIYA GRUNTOVYKH VOD V SEVERNOY CHASTI PRIPYATSKOGO POLES'YA),
Akademiya Navuk BSSR, Minsk. Institut Geokhimii i Geofiziki.
For primary bibliographic entry see Field 02F.
W73-03296

LOSS OF FERTILIZER NUTRIENTS FROM SOILS TO DRAINAGE WATERS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 05B.
W73-03400

HYDROGEN AND OXYGEN ISOTOPE SYSTEMATICS IN WEATHERING PROFILES,
California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
For primary bibliographic entry see Field 02K.
W73-03409

SOIL-MOISTURE AND ENERGY RELATIONSHIPS ASSOCIATED WITH RIPARIAN VEGETATION NEAR SAN CARLOS, ARIZONA,
Geological Survey, Washington, D.C.
I. S. McQueen, and R. F. Miller.
Available from GPO, Washington, D. C. 20402 - Price 60 cents (paper copy). Geological Survey Professional Paper 655-E, 1972. 51 p, 47 fig, 2 tab, 65 ref.

Descriptors: *San Carlos (Ariz).

Measurements of soil-moisture content and stress made under and near selected species of riparian trees in Arizona supply additional knowledge about the mechanism of moisture movement and utilization. Solar radiation provides energy to move soil moisture both upward and downward from the upper part of a soil profile. Profiles of chemical analyses show higher concentrations of salts at the surfaces of unshaded sites than at the surfaces of shaded sites, which indicates that evaporation loss is greater at unshaded sites than at shaded sites. This relation is confirmed by moisture-stress profiles. Profiles of soil-moisture stress under saltcedar and will trees show no evidence of soil-moisture depletion by the trees. At one site, soil moisture increased during the season of maximum plant growth, even though a dense stand of annual grasses was growing on the site. The tree roots may have supplied moisture to the soils to maintain the soil moisture in hydraulic equilibrium with the water table. Cottonwood and mesquite trees, however, deplete soil moisture even when groundwater is available. (Woodard-USGS)
W73-03415

FALLOW AND GRAVEL MULCH EFFECTS ON SOIL WATER STORAGE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 04B.
W73-03521

A COMPARISON OF LYSIMETER-DERIVED POTENTIAL EVAPOTRANSPIRATION WITH COMPUTED VALUES,
Agricultural Research Service, Coshocton, Ohio.
For primary bibliographic entry see Field 02D.
W73-03522

NUTRIENT LOSS FROM CLEARCUTTINGS IN NEW HAMPSHIRE,
Forest Service (USDA), Durham, N.H.
For primary bibliographic entry see Field 04C.
W73-03548

AGROHYDROLOGICAL PROPERTIES OF TRANSBAIKALIAN SOIL (IN RUSSIAN).
For primary bibliographic entry see Field 03F.
W73-03550

SOME ELEMENTS IN THE FERTILITY OF ERODED SOILS AND ITS REGULATION IN THE ROSTOV REGION (IN RUSSIAN),
For primary bibliographic entry see Field 03F.
W73-03690

EFFECTS OF SOIL MOISTURE ON THE GROWTH AND FRUITING OF YOUNG SATSUMA ORANGE TREES (IN JAPANESE),
Kagawa Univ., Takamatsu (Japan). Dept. of Horticulture.
For primary bibliographic entry see Field 03F.
W73-03700

LONG-TERM EFFECTS OF SOIL MANAGEMENT TREATMENTS ON SOIL PHYSICAL CONDITIONS IN A FACTORIAL CITRUS EXPERIMENT,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
P. R. Cary, and G. N. Evans.
J Hortic Sci. Vol 47, No 1, p 81-91. 1972.
Identifiers: *Soil physical properties, *Soil treatment, Ammonium, *Citrus D, Compaction, Infiltration, Soil management, Moisture, Soils, Sulfates, Treatments.

Long-term effects of soil management and (NH4)2SO4 treatments were examined in terms of infiltration and moisture characteristics. Permanent sod had the highest infiltration rate, followed by the following treatments: winter-clover and winter-tick bean cover crops, and bare-surface chemical weed control. Despite inevitable compaction from heavy harvesting and spraying machinery, infiltration rates for non-tilled plots receiving permanent sod or bare-surface treatments were almost identical to those reported 17 yr previously when the experiment had been in progress for only 4 yr. The fact that the deterioration in soil physical conditions initially observed on herbicide-treated plots was not further aggravated by long-term usage is of considerable importance when assessing possible harmful effects of herbicides on soil structure. Moisture characteristics showed results consistent with those obtained by infiltration measurements; samples from permanent sod showed better structure stability and had higher moisture-holding capacities than samples from the bare-surface chemical weed control treatments. Increasing rates of (NH4)2SO4 tended to increase the infiltration rate; this effect was mainly evident on tilled plots. Moisture characteristics also showed a similar beneficial response to N applications. This response was probably due to the release of CaSO4 a soil stabilizing agent, as a result of soil acidification induced by cumulative CaSO4 applications.—Copyright 1972, Biological Abstracts, Inc.
W73-03701

RELIABILITY OF SOIL-MOISTURE DETERMINATIONS (O NADEZHNOSTI METODOV OPREDELENIYA VLAGOZAPASOV V POCHVE),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
For primary bibliographic entry see Field 04A.
W73-03755

PHYSICS OF DESATURATION IN POROUS MATERIALS,
Texaco, Inc., Bellaire, Tex. Bellaire Research Labs.
N. F. White, H. R. Duke, D. K. Sunada, and A. T. Corey.
Journal of the Irrigation and Drainage Division American Society of Civil Engineers, Vol 96, No IR2, Paper 7376, p 165-191, 1970. 17 fig, 2 tab, 15 ref, 3 append.

Descriptors: *Drainage, *Pore pressures, *Porous media, Irrigation, Laboratory tests, Saturation.
Identifiers: *Desaturation.

Previous investigations of the hydraulic properties of porous materials have been primarily empirical, i.e., correlations have been based upon experimental data. A physical description of the desaturation process in porous media is developed by analyzing both discrete and continuous desaturation mechanisms. The desaturation process is characterized by three distinct phases: the boundary-effect zone, the transition zone (primary and secondary), and the residual desaturation zone. Mathematical relationships are developed to relate saturation to capillary pressure which corresponds to a characteristic dimension of the medium. (Skogerboe - Colorado State)
W73-03758

RELEASE OF NITROGEN FROM SULFUR-COATED UREA IN FLOODED SOIL,
National Fertilizer Development Center, Muscle Shoals, Ala.
For primary bibliographic entry see Field 05B.
W73-03759

DRAINAGE OF SOIL PROFILES,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
R. H. Brooks, G. L. Corey, and A. T. Corey.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97, No IR3, Paper 8389, p 455-467, 1971. 9 fig, 13 ref, 2 append.

Descriptors: *Pore pressure, Discharge, Soil properties, *Moisture content, *Drainage, Field capacity, *Soil profiles.
Identifiers: Brooks-Corey approximation, Diffusion theory, Finite difference theory.

The scaled approximations of Brooks and Corey for water content versus capillary pressure and capillary conductivity versus water content were used to obtain a scaled diffusion function that was dependent only upon the pore-size distribution index. A predictor-corrector finite difference scheme was used to obtain numerical solutions for the scaled differential equation for drainage from vertical soil columns. Results of several numerical solutions were presented for two soil profiles and for two greatly different pore-size distributions. The effects of soil hydraulic properties upon drainage were discussed and used to interpret the term field capacity. Experimental data obtained by several independent investigators were compared with theoretical solutions of discharge as a function of time using the Brooks-Corey approximations. The comparisons between experiment and theory were reasonable and some explanations for lack of agreement were presented. (Skogerboe - Colorado State)
W73-03760

PREDICTION OF THE NITROGEN REQUIREMENT OF FIELD CORPS. PART I. THEORETICAL MODELS OF NITROGEN RELEASE,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
J. O. Reuss, and J. M. Geist.
Agronomy Journal, Vol 62, No 3, p 381-384, 1970. 5 ref.

Descriptors: *Model studies, *Nitrogen, Soil testing, Fertilizers, Crop production.
Identifiers: Multiple regression, Nitrogen release.

Theoretical models for the prediction of the total supply of mineral nitrogen available for crop production have been developed. These models are based on the assumption that the supply of available N is determined by fertilizer N, native soil mineral N, and N released from organic matter. Model No. (1) is of the form $Y \pm b0 + b1X1 + b11X12 + b2X2 + b22X22 + b12X1X2$, where: Y ± yield or other parameter dependent on N supply, x1 ± fertilizer N plus available soil mineral N, X2 ± any index of organic N release, and b1, b2, b . . . are coefficients determined by regression techniques. Model No. (2) is of the form $Y \pm B0 + B1 (X1 + aX2) + B2 (X1 + aX2)2$, where: a represents a release coefficient ap-

propriate to a given X2; B0, B1, B2 are regression coefficients; and Y, X1, and X2 are the same as in Model (1). The release coefficient a can be evaluated by ratios of slopes from Model (1), or by a reiterative procedure. More sophisticated models based on Model (2), but assuming nonlinear release of organic N, have also been developed along with methods for evaluating the constants involved. (See also W73-03763) (Skogerboe - Colorado State)
W73-03762

PREDICTION OF NITROGEN FERTILIZER REQUIREMENTS OF FIELD CROPS. II. APPLICATION OF THEORETICAL MODELS TO MALTING BARLEY,
Forest Service (USDA), La Grande, Oreg. Pacific Northwest Forest and Range Experiment Station.
J. M. Geist, J. O. Reuss, and D. D. Johnson.
Agronomy Journal, Vol 62, No 3, p 385-389, 1970. 3 tab, 3 fig, 11 ref.

Descriptors: Soil testing, *Nitrogen, *Model studies, Fertilizers, *Barley, *Nutrient requirements.
Identifiers: Prediction models, Moravian barley, Nitrogen availability, Moravian barley (Hordeum distichum L. emend.Lam).

Five indices of soil organic nitrogen availability and mineral plus fertilizer nitrogen were used in the prediction of grain yield, grain protein content, and grain protein nitrogen of Moravian barley. Three mathematical models were employed, one of which included only soil mineral plus fertilizer N for prediction of crop parameters. The remaining two models, which included both organic and mineral plus fertilizer N showed improved predictability of crop parameters. No organic nitrogen measure showed superiority to others, however, one equation model was advantageous in studying the relative contribution of soil organic N to crop production. (See also W73-03762) (Skogerboe - Colorado State)
W73-03763

NITROGEN MOVEMENT COMPARISONS IN CROPPED VERSUS FALLOWED SOILS,
Georgia Agricultural Experiment Station, Athens.
F. C. Boswell, and O. E. Anderson.
Agronomy Journal, Vol 62, No 4, p 499-503, 1970. 3 tab, 4 fig, 18 ref.

Descriptors: *Nitrogen, Leaching, *Soil properties, Fallowing, Soil management, *Path of pollutants.
Identifiers: Nitrogen movement, Nitrogen recovery, Nitrogen accumulation.

The movement and accumulation patterns of N, applied as KNO3 to cropped and fallowed plots, were studied on two widely different soils, Marlboro and Davidson. Generally, the movement and accumulation patterns indicated movement of N to a greater depth and extent on the cropped than on fallowed plots. Nitrogen movement in the Marlboro surface and subsoil was considerably greater than in Davidson soil. Even with excessive rainfall, most of the N recovered 11 to 12 months after application was concentrated between the 46- to 122-cm depths with the largest accumulation occurring in the 61- to 91-cm layer. After 10 weeks and 29 cm of rainfall, 78 percent of the applied N was recovered on the fallowed Davidson soil while after 50 weeks and 154 cm of rainfall 53 percent was recovered. Comparable recoveries for the cropped plots were 89 and 49 percent respectively. After 5 weeks and 12 cm rainfall, the recovery on the fallowed plots of the Marlboro soil was 109 percent but had decreased to 33 percent after 46 weeks and 124 cm of accumulated rainfall. Data for cropped plots indicated 119 and 25 percent recovery for the respective sampling periods. Recovery increased approximately 5 to 10 percent on the cropped plots when the plant N uptake values were included. (Skogerboe-Colorado State)
W73-03771

SOME CHEMICAL PROPERTIES OF SOILS FROM AREAS OF BARLEY GRASS (HORDEUM MURINUM L.) INFESTATION,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
A. J. Metson, W. M. H. Saunders, and J. H. Nott.
New Zealand Journal of Agricultural Research, Vol 14, No 2, p 334-351, 1971. 7 tab, 33 ref.

Descriptors: Chemical analysis, *Salinity, Nutrients, *Soil analysis, *Soil chemical properties.
Identifiers: Hawke's Bay district, *Barley grass, Soluble salt content.

Chemical analyses of soils (0-1 in) under pastures in the Hawke's Bay district showing heavy (H), moderate (M), or light (L) infestations of barley grass (Hordeum murinum L.) showed values for Truog P, organic C, total N, and exchangeable Ca, Mg, K, and HH4 in the order H>M>L. Concentrations of total soluble salts were also in the order H>M>L, and the order of abundance of individual ions was: for cations, K+Ca2+>Mg2+>Na+; for anions, HCO3 (-)>NO3>Cl-SO4 (2). The results were consistent with the hypothesis that invasion of pastures by barley grass is favored by the development of saline areas of high nutrient content resulting from heavy accessions of animal dung and urine at sites where stock congregate. It is suggested that with continued camping of stock, sites in low-rainfall districts at present heavily infested with barley grass may eventually be superseded by bare ground because of increasing soil salinity. Seed counts on soils (sampled in March) gave Hordeum counts in the order H>M>L. Germination tests on the same soils showed seedling emergence for different species as follows: Hordeum marinum, H>M>L; other grasses, H><L<M; clovers, H<M<L; weeds, H>L>M. (Skogerboe-Colorado State)
W73-03772

THE MEASUREMENT AND MECHANISM OF ION DIFFUSION IN SOILS V. DIFFUSION OF HYDROGEN ION IN SOILS,
Oxford Univ. (England). Soil Science Lab.
E. Farr, L. V. Vaidyanathan, and P. H. Nye.
The Journal of Soil Science, Vol 21, No 1, p 1-14, 1970, 8 fig, 2 tab, 18 ref, 2 append.

Descriptors: *Diffusion, *Cation exchange, *Ions, Hydrogen, Calcium, *Soil chemical properties, Soil analysis.
Identifiers: Flux, Buffer, *Hydrogen ions.

The linear diffusion of H ion from a series of soil blocks, containing essentially H and Ca only as exchangeable cations, into a sink solution maintained at pH 5.2 has been studied. In three separate series of experiments, first the total concentration of diffusible H, then the amount of diffusible H in the pore solution, and finaliy the amount of exchangeable H associated with the solid phase have been successively varied. The effect of the resulting flux and diffusion coefficients of the ion has been related to the H buffer power of the soil. The impedance factor of the ion through the liquid pathway is slightly lower than that for other cations determined in soil. The diffusive flux of H occurs through the liquid pathway, and the contribution of solid-associated H is small, except possibly at low H ion solution concentrations. (Skogerboe-Colorado State)
W73-03773

SOIL TEMPERATURE AND SOURCE OF NITROGEN IN RELATION TO NITRIFICATION IN SODDED AND CULTIVATED SOILS,
Georgia Univ., Athens. Coll. of Agricultural Experiment Stations.
O. E. Anderson, L. S. Jones, and F. C. Boswell.
Agronomy Journal, Vol 62, No 2, p 206-211, 1970. 2 tab, 6 fig, 11 ref.

Descriptors: *Nitrification, Incubation, *Soil temperature, Rotation, *Nitrogen, *Grasses, Bermuda grass.
Identifiers: Nitrogen recovery, Nitrogen inhibition, Fescue.

Sods of coastal bermudagrass and fescue in permanent pastures or in sod-based rotations did not greatly inhibit nitrification of applied N at 32 deg C. Nitrification was strongly inhibited by sods in the finer textured soils at 6 deg C, especially those high in silt content. Though there were differences in nitrification rates among several sources of N, they were not strongly related to cropping practices. There were wide differences among the various N sources in the percent recovery of applied N. The percent recovery at 32 deg C was always higher in sodded than in cultivated soils, irrespective of source, but at 6 deg C the effect of cropping practice was inconsistent. (Skogerboe - Colorado State)
W73-03775

IRRIGATION INVESTIGATIONS IN OTAGO, NEW ZEALAND VI. PHYSICAL PROPERTIES OF SOILS OF THE KUROW DISTRICT,
Department of Agriculture, Mosgiel (New Zealand). Invermay Agricultural Research Center.
G. G. Cossens, and D. S. Rickard.
New Zealand Journal of Agricultural Research, Vol 13, No 2, p 209-217, 1970. 5 tab, 1 fig, 10 ref.

Descriptors: *Soil moisture, Climate, Geology, Topography, *Soil properties, Irrigation.
Identifiers: *New Zealand.

The yellow-grey earths of the Kurow-Duntroon area have a higher percentage of fine particles and organic carbon and are deeper than soils of the same group in the Ida Valley, the Arrow Basin, the Upper Clutha Valley, and the Maniototo Plains. Because of the high 15-bar retention value, the available moisture (2.55 in) in the top 12 in of the Kurow-Duntroon soils is not particularly high. Over the soil profile, however, the greater depth of soil means that the total available moisture is higher than that found in previous studies on soils of similar groups. Low macroporosities indicate that over-irrigation may lead to waterlogging of some soils. (See also W72-06540 and W72-06825) (Skogerboe - Colorado State)
W73-03784

THE DISTRIBUTION OF NITRIFYING BACTERIA IN SOIL AGGREGATES,
Tohoku Univ., Sendai (Japan). Inst. for Agricultural Research.
For primary bibliographic entry see Field 05B.
W73-03796

FRUITING IN COTTON AS AFFECTED BY WATER AND NUTRIENT REGIME IN SOIL (IN BULGARIAN),
Academy of Agricultural Sciences, Chirpan (Bulgaria). Inst. of Cotton.
For primary bibliographic entry see Field 03F.
W73-03806

THE INFLUENCE OF VARIABLE IRRIGATION OF ALFALFA ON SOME CHEMICAL AND STRUCTURAL MODIFICATIONS IN LEACHED CINNAMON-COLORED FOREST SOILS (IN BULGARIAN),
Academy of Agricultural Sciences, Pazardzik (Bulgaria). Experiment Station of Irrigated Agriculture.
For primary bibliographic entry see Field 03F.
W73-03808

STUDY ON INTERRELATIONS OF LUCERNE, RED CLOVER AND ORCHARDGRASS IN IR-

RIGATED MIXTURES ON CHERNOZEM SOILS IN THE PLEVAN AREA (IN BULGARIAN),
Institut po Furazhite, Pleven (Bulgaria).
For primary bibliographic entry see Field 03F.
W73-03810

THE SOIL AND ENVIRONMENTAL POLLUTION (IN NORWEGIAN),
Norske Skogforsoksvesen, Vollebekk. Skogokol. Avdeling.
For primary bibliographic entry see Field 05G.
W73-03852

RESTITUTION TO THE SOIL OF MINERAL ELEMENTS BY LITTER FALL AND PRECIPITATION IN FOUR FOREST STANDS IN EASTERN FRANCE (IN FRENCH),
Centre National de Recherches Forestieres, Nancy (France). Station de Sylviculture et de Production.
G. Aussenac, M. Bonneau, and F. LeTacon.
Oecologiaplant. Vol 7, No 1, p 1-21. 1972. English summary.
Identifiers: *Forest soils, *Soil management, Abies grandis G, Boron, Calcium, Carpinus betulus D, Copper, Fagus sylvatica D, Fall, Forests, France, Litter, Manganese, Minerals, Nitrogen, Phosphorus, Picea abies G, Pinus sylvestris G, Potassium, Precipitation, Restitution, Soils, Stands.

Variations of the mineral composition of the litter were measured monthly during 2 yr, in 3 coniferous stands (Picea abies, Pinus sylvestris, Abies grandis) and 2 mixed broadleaved stand (Fagus sylvatica and Carpinus betulus). The litter is poorer in N, P, K and richer in Ca, Mn, Cu than the living leaves or needles. The lowest content in N, P, K takes place in autumn, the highest in spring, while the highest content in Ca, Mn and B takes place in autumn. Total fall of nutrients were estimated in the 4 stands. In the spruce-stand a more complete calculation was made, including elements of the incident rainfall, stem flow and through fall. Only the K returns in great quantity to the soil in the leachates.--Copyright 1972, Biological Abstracts, Inc.
W73-03853

BIOLOGICAL PURIFICATION OF RESIDUAL WATERS OF PAPER MILLS BY SOIL INFILTRATION: I. MODIFICATIONS IN THE WATERS DURING THEIR PASSAGE, (IN FRENCH),
Bordeaux Univ., Talence (France). Lab. of Botany and Applied Microbiology.
For primary bibliographic entry see Field 05D.
W73-03863

PERIODIC CHANGES IN THE IONIC CONCENTRATIONS FO SOME SUBMERGED SOILS OF BIHAR,
Fertilizer Corp. of India, Sindri.
D. Biswas, J. D. Naphade, and S. P. Dhua.
Agron J. Vol 64, No 3, p 336-338. 1972. Illus.
Identifiers: *Soil chemical properties, Ammonium, *Bihar (India), Carbonates, Chlorides, Fertilizers, Ions, Minerals, Oryza sativa M, Rice, Soils, Submerged soils.

The investigation was carried out under laboratory conditions to study the chemistry of submerged soils of Bihar to help in assessing their potentialities in meeting the nutritional requirements of the rice plant (Oryza sativa L.). The soils were kept at 1:1.5 soil:water ratio and analyzed periodically for pH, electrical conductivity, soluble NH4+, Fe++, Mn++, P, Na+, K+, Ca++, CO3±, HCO3-, and Cl- on the 15th, 30th, 45th, and 60th day. The results show differential release of these nutrients in different soils with time. While the pH of acidic soils increased, that of alkaline soils decreased with the time of submergence. The pH of all soils fell between 6.50 and 8.50 on the 60th day. In general the peak values of Mn+++ and CO3± were noted on the 15th day, HCO3- and Cl- on the 30th day, and that of NH4+ between the 30th and 45th day after submergence. Most of the soils appear to be inherently deficient in N, P, K, Fe++, etc. and a good response of rice to fertilizer applications may be expected.--Copyright 1972, Biological Abstracts, Inc.
W73-03896

SOME RELATIONSHIPS BETWEEN CONSTITUENTS OF IRRIGATION WATERS AND PROPERTIES OF IRRIGATED SOILS OF WESTERN RAJASTHAN,
Udaipur Univ. (India).
K. V. Paliwal, and G. L. Maliwal.
J Indian Soc Soil Sci. Vol 19, No 3, p 299-303. 1971.
Identifiers: Adsorption, India, *Irrigated soils, Irrigation, *Rajasthan, Sodium, Soils, *Electrical conductivity.

Electrical conductivity and contents of Ca, Mg, Na and K in the irrigation waters are significantly correlated with those of the saturation extract of soils. Significant correlation of Na adsorption ratio (SAR) and soluble Na percentage both of irrigation waters and saturation extracts exists with the exchangeable Na percentage of soil. However, no such relation was found between SAR and exchangeable Na ratio of soils.--Copyright 1972, Biological Abstracts, Inc.
W73-03898

EFFECT OF PHYSICAL AND CHEMICAL PROPERTIES ON ERODIBILITY OF SOME SOILS OF MALWA PLATEAU,
Mississippi State Univ., State College. Dept. of Agronomy.
M. Haridasan, and R. K. Chibber.
J Indian Soc Soil Sci. Vol 19, No 3, p 293-298. 1971.
Identifiers: Aggregates, *Calcium carbonate, India, Iron, Madhya, *Malwa plateau, Pradesh, Silica, Soils, *Soil erosion.

Erosion ratio was negatively correlated with clay/(silt + sand) ratio, percentage of water stable aggregates larger than 0.25 mm, percentage of exchangeable Ca in the soil, and silica-Fe oxide ratio. Highly significant positive correlations were obtained between erosion ratio and the percentage of volume expansion, and between erosion ratio and moisture equivalent. A linear regression equation relating the erosion ratio to clay/ (silt + sand) ratio, moisture equivalent, and the percentage of Ca CO3 is described to estimate erosion ratio in these and similar soils.--Copyright 1972, Biological Abstracts, Inc.
W73-03899

MEASUREMENT OF INFILTRATION RATE IN SOME OF SOILS OF TUNGABHADRA PROJECT AREA,
University of Agricultural Sciences, Bangalore (India). Dept. of Chemistry and Soils.
A. S. Hadimani, and N. G. Perur.
J Indian Soc Soil Sci. Vol 19, No 3, p 231-235. 1971. Illus.
Identifiers: India, *Infiltration note, Infiltrometer, *Measurement, Soils, *Tungabhadra project.

Infiltration tests were made by means of the double ring infiltrometer under variable head and followed by constant head after the intake rate was almost stabilized in the former. The various types of soils differing in texture and other conditions at the surface affected markedly the infiltration rate. The deep black clayey soils showed low intake of water in the first hr of the test and its final rate was 6.1 cm/hr under constant head. The deep black transported clayey type of soil showed 10.0 cm of water intake/hr. In red sandy loam soil which was plowed during summer, the infiltration rate was 9.8 cm/hr. The land having plant cover exhibited the maximum infiltration rate of 18.1 cm/hr. However, the saline-alkali soil showed the minimum intake rate of only 1.9 cm/hr.--Copyright 1972, Biological Abstracts, Inc.
W73-03900

2H. Lakes

FLUSHING OF SMALL SHALLOW LAKES,
Washington State Univ., Pullman. R. L. Albrook, Hydraulic Lab.
For primary bibliographic entry see Field 05C.
W73-03252

DIATOM POPULATIONS CHANGES IN LAKE GEORGE, N.Y.
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
For primary bibliographic entry see Field 05C.
W73-03258

BIOCHEMICAL UPTAKE OF OXYGEN IN RESERVOIRS,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05A.
W73-03299

USE OF THE 'OPTICAL INDEX' FOR DETERMINING THE WATER COLOR OF RESERVOIRS,
Akademiya Nauk SSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05A.
W73-03301

LUMINESCENCE SPECTRA OF CERTAIN INLAND WATEUS,
Akademiya Nauk SSSR, Mosocow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05A.
W73-03303

EFFECT OF LAKES ON MINIMUM STREAMFLOW IN WEST SIBERIA (VLIYANIYE OZER NA MINIMAL'NYY STOK REK ZAPADNOY SIBIRI),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W73-03535

RADIOACTIVITY OF LAKE MICHIGAN, AUGUST-SEPTEMBER 1970.
Environmental Protection Agency, Washington, D.C. Office of Water Programs.
For primary bibliographic entry see Field 05A.
W73-03601

FIRST FOOD OF LARVAL YELLOW PERCH, WHITE SUCKER, BLUEGILL, EMERALD SHINER, AND RAINBOW SMELT,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 05C.
W73-03652

APPLICATION OF THE MATHEMATICAL SIMULATION METHOD TO THE STUDY OF THE ROLE OF PHOTOSYNTHETIC AERATION OF LAKES,
Akademiya Nuak SSSR, Moscow. Inst. of Evolutionary Physiology.
For primary bibliographic entry see Field 05C.
W73-03689

A COMPILATION OF THE AVERAGE DEPTHS OF LAKE MICHIGAN AND LAKE ONTARIO ON A TWO-MINUTE GRID,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 07C.
W73-03735

BOGS IN THE REGION OF THE SHATSK LAKES (IN RUSSIAN),
T. L. Andriyenko, A. I. Kuz'mychov, and O. I. Pryadko.
Ukr Bot Zh. Vol 28, No 6, p 727-733. 1971. Illus. English summary.
Identifiers: *Bogs, *Shatsk, Lakes, Sphagnum, USSR.

The bogs are described from the environs of the Shatsk lakes in the northwestern part of the Volyn region. The characteristic bog vegetation types were mesotrophic and eutrophic Sphagnum cenoses. Stratigraphy of 3 bogs and their development is given.--Copyright 1972, Biological Abstracts, Inc.
W73-03854

FOUR YEARS OF FISHERY (1964-67) IN LAKE TRASIMENO (IN ITALIAN),
Perugia Univ. (Italy). Instituto di Idrobiologia e Pescicultura.
F. S. Gianotti.
Riv Idrobiol. Vol 8, No 1/2, p 17-65. 1969. Illus. English summary.
Identifiers: Italy, *Lake Trasimeno, Years, Commercial fish, *Lake fisheries, Fishing, Fish harvest.

Species of commercial significance, annual production and catch statistics of the fish in Lake Trasimeno, Italy, are presented. Data were obtained from 1964-1967 and the figures are compared with earlier years. The most favorable month for fishing a particular species is also given.--Copyright 1972, Biological Abstracts, Inc.
W73-03855

PREDICTION OF BALANCE OF MATTER IN STORAGE RESERVOIRS BY MEANS OF CONTINUOUS OR SEMICONTINUOUS BIOLOGICAL MODELS: I. BASES (IN GERMAN),
Technische Universitaet, Dresden (East Germany).
For primary bibliographic entry see Field 05C.
W73-03862

PHARYNGEAL TEETH IN THE BREAM (ABRAMIS BRAMA) FROM THE KUIBYSHEVSKY WATER RESERVOIR (IN RUSSIAN),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
A. V. Lukin.
Zool Zh, Vol 50, No 6, p 948-950, 1971, English summary.
Identifiers: Abramis-Brama, *Bream, *Kuibyshev Reservoir (USSR), Migration, *Pharyngeal teeth, Reservoirs, USSR.

Local populations of the bream in different regions of the Kuibyshevsky Water Reservoir markedly differ from each other in the number of specimens with distichous teeth. Such breams are least abundant in the central part of the Kamsky Bay (about 10.7% of investigated fishes) and most abundant far from the place of Kama and Volga confluence. In some regions there are age differences in the occurrence of fishes with distichous pharyngeal teeth which evidently arise as a result of migrations due to unfavorable hydrochemical conditions in the Kamsky Bay.--Copyright 1972, Biological Abstracts, Inc.
W73-03873

MORPHOLOGICAL CHARACTERISTICS OF THE LAKE CHUD WHITEFISH ACCLIMATIZED IN THE URALS (IN RUSSIAN),
G. M. Lopatyshkina.
Tr Ural Otd Sib Nauchno-Issled Inst Rybn Khoz, 8: p 91-101, (1971).
Identifiers: Acclimatization, Dimorphism, Lakes, Morphological characteristics, *Urals, USSR, *Whitefish, *Lake Chud (USSR), Sex (Fish).

Differences among whitefish populations in different types of lakes were observed. In the populations studied sexual dimorphism was very weakly pronounced. Changes in the shape of the mouth including shortening of the lower jaw and lengthening of the snout, and a decrease in the length of the gill rakers were evidently caused by nutritional factors. The high plasticity of the Lake Chud whitefish has a great adaptive significance.--Copyright 1972, Biological Abstracts, Inc.
W73-03874

NATURAL HYBRIDS OF WHITE BREAM AND OTHER SPECIES FROM THE FAMILY CYPRINIDAE (IN RUSSIAN),
Y. A. Pushkin.
Tr Ural Otd Sib Nauchno-Issled Inst Rybn Khoz. 8: p 103-109, 1971.
Identifiers: Abramis, Bleak, Blicca, *Bream, *Cyprinidae, Family, *Hybrids (Fish), Rudd, Species, USSR, White bream.

In reservoirs on the Kama River white bream (Blicca) breed with 4 spp. of fish: rudd, bleak, roach and bream (Abramis). Bream X white bream predominate in the Kamskoe Reservoir; russ X bleak predominate in the Votkinskoe Reservoir.--Copyright 1972, Biological Abstracts, Inc.
W73-03875

INFORMATION ON THE REPRODUCTION ON THE EUROPEAN GRAYLING (IN RUSSIAN),
E. A. Zinov'ev.
Tr Ural Otd Sib Nauchno-Issled Inst Rybn Khoz. 8: p 133-142, 1971.
Identifiers: *Grayling (European), Information, *Reproduction (Fish), USSR, *Spawning.

Grayling spawning in the Vishera and Vels Rivers of the Kama River basin were studied. Spawning in the basin occurs in May through the beginning of June. Egg laying in the entire area is from Feb. through July. As a whole, the age of attainment of sexual maturity in the European grayling varies from 2-7 yr. The length of fish at the onset of maturity varies from 15-37 cm, the weight from 30-600 g. Spawning occurs at a temperature of 2.5-11.6 deg. The optimum for the majority of the population is 5-8 deg. Egg laying takes place on fine-grained shingle, gravel and sometimes sandbanks at a depth less than 1 m with a weak current or at a depth up to 4 m in lakes. The number of age groups of fish spawning in the rivers and streams of the Kama basin varies from 2-6. Those spawning for the first time predominate. This is due to fishing.--Copyright 1972, Biological Abstracts, Inc.
W73-03876

2I. Water in Plants

SOIL-MOISTURE AND ENERGY RELATIONSHIPS ASSOCIATED WITH RIPARIAN VEGETATION NEAR SAN CARLOS, ARIZONA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02G.
W73-03415

WATER METABOLISM IN MOSS LEAVES,
Kazan State Univ. (USSR).
F. G. Karimova.
Fiziol Rast. Vol 18, No 1, p 211-213. 1971. Illus.
Identifiers: Absorption, Biochemical studies, Climacium dendroides, Hypertonic solutions, Hypotonic solutions, Leaves, *Metabolism, *Moss leaves, Physical processes, Respiration.

The rate of water escaping from the leaves of the moss Climacium dendroides placed in a hypertonic sugar solution was greatest during the first minute. When dryer leaves were placed in a hypotonic solution the maximum absorption was also greatest during the first minute. NaF in the solution was used to study the effects of inhibited respiration on the processes of absorption and release. The release of water was more suppressed by the inhibitor than absorption. The maximum effect on release was during the first 2 min. The release of water therefore uses more respiratory energy than absorption, which suggests the mechanisms differ for each of these processes. The release of water is associated with swelling of the cell colloid in macromolecular dehydration, an exothermic process. Water metabolism in this moss appears to b combined process involving physical diffusion to fill a 'free space' and biochemical processes associated with energy expenditure during additional advancement of water into the cell.--Copyright 1972, Biological Abstracts, Inc.
W73-03480

NET PHOTOSYNTHESIS, GROWTH, AND TRANSPIRATION IN AMERICAN ELM SEEDLINGS AS INFLUENCED BY DUTCH ELM DISEASE AND PLANT-WATER STRESS,
Agricultural Research Service, Delaware, Ohio. Plant Science Research Div.
B. R. Roberts.
Phytopathology. Vol 62, No 4, p 457-459. 1972. Illus.
Identifiers: *Plant diseases, Ceratocystis ulmi, *American Elm, Growth, Photosynthesis, Seedlings, Moisture stress, Transpiration, Ulmus americana D.

Young American elm (Ulmus americana) seedlings were inoculated with the Dutch elm disease pathogen (Ceratocystis ulmi) or subjected to plant-water stress prior to measuring net photosynthesis, growth, and transpiration for a period of 5 wk. Both treatments resulted in depressed growth when compared to untreated controls. The data for net photosynthesis and transpiration suggest that the pattern of symptom development in inoculated seedlings is different from plants experiencing an internal moisture deficit.--Copyright 1972, Biological Abstracts, Inc.
W73-03698

REPRODUCTION OF THREE SPECIES OF OAK IN RELATION TO VEGETATIONAL AND ENVIRONMENTAL GRADIENTS IN THE SOUTHERN BLUE RIDGE,
Ohio State Univ., Columbus. Dept. of Botany.
C. H. Racine.
Bull Torrey Bot Club. Vol 98, No 6, p 297-310. 1971. Illus.
Identifiers: *Distribution patterns, Environment, Gradients, Growth, Light, Moisture, *Oak trees, Quercus coccinea D, Quercus primus D, Quercus rubra D, Plant reproduction, Seedlings, Soils, Species, Vegetation, Appalachian Mountain Region.

The population dynamics of 3 spp of oak vary with slope position and help to explain the distribution patterns of Quercus rubra L., Q. prinus L., and Q. coccinea Muenchh, along southern Appalachian slopes. Gradient analysis techniques were used to determine the relationships of distribution, reproduction, and seedling growth to slope position and aspect and to the associated soil, light, and moisture gradients. Reproduction up a slope takes place in gradients of decreasing soil nutrients and moisture, increasing soil clay content, and increasing light intensity. Q. rubra, which had the highest seedling yield and growth rate under all ex-

perimental light intensities, soil types, and moisture levels, is dominant on the lower slopes but yields its dominance on the upper slopes to the slower growing Q. prinus and Q. coccinea. The seedlings of each species are more widely distributed over the slope than are adult individuals of the same species. On the lower slopes, young individuals of Q. rubra have a lower probability of mortality than do those of Q. prinus due to the former's tolerance for the low light intensity and its high growth rate, which permits it to compete with the other fast growing trees there. A presumed replacement of Q. rubra by Q. prinus and Q. coccinea upslope is related to the low nutrient demand of the latter, which allows them to persist and eventually grow faster than Q. rubra beyond the pole stage, and to their more abundant production of offspring (partly by sprouting). In turn, on the ridge, Q. coccinea, rather than Q. prinus, assumes dominance as a result of its greater ability to withstand the occasional droughts there and to grow at lower levels of soil moisture.--Copyright 1972, Biological Abstracts, Inc.
W73-03707

A BRYOPHYTE FLORA OF NORTH SOMERSET,
J. Appleyard.
Trans Br Bryol Soc, Vol 6, No 1, p 1-40, 1970, Illus.
Identifiers: Bryophyte, England, *Flora, Hepatics, Mosses, *North Somerset, Sphagnum.

At the end of 1969, the number of species and varieties substantiated by specimens are hepatics 91 spp., 3 var.; sphagna 10 spp., 2 var.; and true mosses 308 spp., 38 var. Data on geology, geography, fossil records, climate, pollution and habitat destruction and collectors are included.--Copyright 1972, Biological Abstracts, Inc.
W73-03718

OXYGEN DIFFUSION IN THE SOIL-PLANT SYSTEM. I. A MODEL,
California Univ., Riverside. Dept. of Soils and Plant Nutrition.
R. J. Luxmoore, L. H. Stolzy, and J. Letey.
Agronomy Journal, Vol 62, No 3, p 317-322, 1970. 4 fig, 10 ref, append.

Descriptors: *Aeration, *Respiration, Computer analysis, Model studies, Oxygen, *Diffusion.
Identifiers: Plant aeration, Soil aeration, *Root respiration, Steady state model, Oxygen diffusion.

A model for steady state, isothermal oxygen diffusion into a cylindrical root surrounded by a water film of uniform thickness is proposed. Equations are developed which account for longitudinal oxygen flux through the intercellular gas spaces, radial flux through the water film, and a respiratory oxygen sink which is defined as a function oxygen concentration. A method of computer analysis is outlined whereby the law of continuity is applied sequentially to small sections of root, such that the amount of oxygen diffusing into a section is equated with the oxygen diffusing out plus the respiratory consumption. The solution for the model defines a series of oxygen concentrations along the root length. From these data the amount of oxygen consumed in respiration which diffuses into the top of the root (plant aeration) and the amount diffusing radially from the soil (soil aeration) may be calculated, and effects of soil and plant characteristics examined. (See also W73-03765 and W73-03766) (Skogerboe - Colorado State)
W73-03764

OXYGEN DIFFUSION IN THE SOIL-PLANT SYSTEM. II. RESPIRATION RATE, PERMEABILITY, AND POROSITY OF CONSECUTIVE EXCISED SEGMENTS OF MAIZE AND RICE ROOTS,
California Univ., Riverside. Dept. of Soils and Plant Nutrition.
R. J. Luxmoore, L. H. Stolzy, and J. Letey.
Agronomy Journal, Vol 62, No 3, p 322-324, 1970. 2 tab, 3 fig, 11 ref.

Descriptors: *Respiration, *Root systems, Permeability, Porosity, *Oxygen, *Diffusion, Plant physiology, *Rice.
Identifiers: Maize (Zia mays L.), Oxygen concentration, Pycnomometer method, *Root respiration.

Respiration rates were determined at 4.4, 20.8 and 80 percent oxygen concentration for consecutive excised segments of maize (Zea mays L.) and rice (Oriza sativa L.) roots. From these data, the maximum respiration rate, the oxygen concentration at which respiration was half of the maximum rate, and the root permeability to oxygen were derived for each position along the root, up to 10 cm from the root tip for maize and 6 cm for rice. The gas-filled porosity of these segments was measured by the pycnometer method. The root tip segment is characterized by the highest maximum respiration rate, highest permeability, and lowest porosity. Both respiration and permeability decrease with distance from the root tip, whereas porosity increases to a maximum of 10 percent for maize and 33 percent for rice. The oxygen concentration at which respiration is half of the maximum rate is about 8 percent for maize and about 16 percent for rice at each position along the root. (See also W73-03764 and W73-03766) (Skogerboe - Colorado State)
W73-03765

OXYGEN DIFFUSION IN THE SOIL-PLANT SYSTEM. IV. OXYGEN CONCENTRATION PROFILES, RESPIRATION RATES, AND RADIAL OXYGEN LOSSES PREDICTED FOR RICE ROOTS,
California Univ., Riverside. Dept. of Soils and Plant Nutrition.
R. J. Luxmoore, L. H. Stolzy, and J. Letey.
Agronomy Journal, Vol 62, No 3, p 329-332, 1970. 6 fig, 3 tab, 9 ref.

Descriptors: *Respiration, *Rice, *Oxygen, *Root systems, Plant physiology.
Identifiers: Oxygen concentration profiles, Respiration rate, Radial loss, Oxygen diffusion, Rice root model, Root radius.

Oxygen concentration profiles, mean respiration rates, and the percent radial oxygen losses (proportion of the oxygen diffusing into the top of the root that is lost radially from the root) were obtained from an analysis of steady state oxygen diffusion in rice (Oryza sativa L.) root models under simulated paddy field conditions. An increase in root radius and water layer thickness results in an increase in the oxygen concentration within the root and at the root wall at all positions along the root. These higher oxygen concentrations resulted in higher mean respiration rates, however, the percent radial oxygen loss (PRL) was reduced. The mean respiration rate and PRL were both decreased with increase in root length. Under paddy conditions it seems that oxygen concentration is a factor limiting respiration rate since the mean respiration rate is much less than the maximum rate for mature root tissue. A 20-cm root with a 0.05-cm radius is predicted to radially lose about 5 to 7 percent of the oxygen diffusing into the top of the root. This has considerable ecological significance for roots growing in an anaerobic medium. (See also W73-03764 and W73-03765) (Skogerboe - Colorado State)
W73-03766

EFFECT OF MULCHES AND BED CONFIGURATION. II. SOIL TEMPERATURE AND GROWTH AND YIELD RESPONSES OF GRAIN SORGHUM AND CORN,
Agricultural Research Service, Temple, Tex. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 03F.
W73-03783

WATER DEFICIT EFFECTS ON CORN. I. VEGETATIVE COMPONENTS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 03F.
W73-03785

WATER DEFICIT EFFECTS ON CORN. II. GRAIN COMPONENTS,
Iowa State University, Ames. Dept. of Agronomy.
M. M. Claassen, and R. H. Shaw.
Agronomy Journal, Vol 62, No 5, p 652-655, 1970. 8 fig, 1 tab, 6 ref.

Descriptors: Corn (Field), Fertility, *Moisture stress, *Moisture deficit, Soil moisture, *Crop production.
Identifiers: Corn growth stages, Kernel weight corn.

Under controlled irrigation, corn plants grown in large containers were subjected to water deficits in one of nine periods during each of two growing seasons. The first experiment (1965) differed from the second (1966) by somewhat different timing of treatments and by limiting soil fertility conditions. A significant grain yield reduction (12 to 15 percent) was observed after stress during the vegetative period at early ear shoot and ovule development in 1966. A 53 percent grain yield reduction was associated with stress at 75 percent silking in 1965. In the 3-week period after silking, water deficits consistently reduced yields approximately 30 percent in both years. Significant reductions in kernel numbers were associated with yield reductions from stress before or during silking and pollination. Kernel weights were significantly reduced by stress during or after silking. Trends in the percentage of developed kernels in each of three ear sections indicated that the ability of kernels to compete for products of photosynthesis correlated with the comparative age of the ovule or kernel at the time of water deficit. (See also W73-03785) (Skogerboe - Colorado State)
W73-03786

LIMITATION TO WATER FLUX FROM SOILS TO PLANTS,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
A. R. G. Lang, and W. R. Gardner.
Agronomy Journal, Vol 62, No 6, p 693-695, 1970. 1 tab, 2 fig, 8 ref.

Descriptors: *Moisture uptake, Cotton, Absorption, Soil moisture, *Soil-water-plant relationships.
Identifiers: Water potential, Flux density.

From theoretical considerations it can be shown that there is an upper limit to the rate at which water can be taken up from the soil by plant roots. This occurs when the unsaturated permeability of the soil adjacent to the roots decreases more rapidly than the increase in the water potential gradient. Flux and water potential measurements obtained experimentally on cotton plants are consistent with this conclusion. (Skogerboe - Colorado State)
W73-03787

RESPONSE OF LOWLAND RICE TO VARYING LEVELS OF SOIL, WATER, AND FERTILITY MANAGEMENT IN DIFFERENT SEASONS,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.

W73-03801

DESCRIPTION OF GASTROPODS OF THE PERUVIAN MANGROVES (IN SPANISH),
Universidad Nacional Agraria, La Molina (Peru). Departamento de Biologia.
G. M. Pena.
An Cient (La Molina), Vol 9, No 1/2, p 46-55, 1971, Illus, English summary.
Identifiers: Commercial value, Description, Distribution, *Gastropods, *Mangroves, Peruvian mangroves, Predators.

The description, measurements and distribution are presented of the 32 spp. of gastropods found in the Peruvian mangroves. Also mentioned are the predacious species and those of commercial value.--Copyright 1972, Biological Abstracts, Inc.
W73-03814

EFFECTS OF TEMPERATURE AND MOISTURE ON THE GERMINATION OF TWO ECOTYPES OF SONCHUS ARVENSIS L.,
Groningen Rijksuniversiteit, Haren (Netherlands). Afdeling Plantenoecologie.
D. M. Pegtel.
Acta Bot Neerl. Vol 21, No 1, p 48-53. 1972. Illus.
Identifiers: Arable land, Dunes, *Ecotypes, *Germination, Moisture, *Sonchus-Arvensis-D, Temperature.

In the Netherlands 2 ecotypes of S. arvensis L. are found: var. arvensis (arable type) on arable land and var. maritimus G. F. W. Mey. (coastal type) in coastal dunes. These differ in their response to temperature and moisture during germination. The coastal type germinates faster than the arable type and its germination occurs at lower temperatures. Furthermore the coastal type germinates at lower moisture tensions. From these experiments it appears that the coastal type is better adapted to the germination conditions prevailing in the dune habitat. The germination characteristics of the arable type fit in well with its natural distribution pattern.--Copyright 1972, Biological Abstracts, Inc.
W73-03864

CHARACEAE ASSOCIATIONS IN THE FLOOD ZONE OF THE DANUBE (IN RUMANIAN),
Bucharest Univ. (Rumania). Faculty of Biology.
V. Ionescu-Teculescu.
Rev Roum Biol Ser Bot. Vol 17, No 1, p 9-18. 1972. English summary.
Identifiers: Associations, *Characeae, *Danube River, *Flood zones, *Romania.

Seven associations are described: Charetum tomentosae (Sauer 1937) Corillion 1957, Charetum fragilis Corillion 1957, Charetum vulgaris Corillion 1957, Charetum braunii Corrilion 1957, Lychnothamnetum barbati n. ass., Tolypelletum proliferae Corrilion 1957, Charetum conniventis Corillion 1957. The associations Charetum tomentosae, Tolypelletum proliferae, Charetum conniventis are new for Romania.--Copyright 1972, Biological Abstracts, Inc.
W73-03865

CO2 GAS EXCHANGE AND WATER BALANCE OF PLANTS IN THE NEGEV DESERT AT THE END OF THE DRY PERIOD,
Wuerzburg Univ. (West Germany). Botanisches Institut II.
O. L. Lange, W. Koch, and E. D. Schulze.
Identifiers: *Carbon dioxide, Citrullus-Colocynthis-D, Datura-Metel-D, Deserts, *Israel, Plants, Prunus-Armeniaca-D, Temperature, Vitis-Vinifera-D, *Water balance, *Negev Desert.

At the Avdat Research Center in Israel the CO2 gas exchange of leaves of Prunus armeniaca, of Vitis vinifera, of Datura metel, and of Citrullus colocynthis were determined. From the results and corresponding meteorological data relative humidity transpiration productivity (quotient of assimilation and transpiration), the water vapor gradient, and the total diffusion resistance were calculated with the view of explaining the behavior of typical desert plants at the time of their greatest need for water and thus the physiological processes underlying ecological adaptation. Conspicuous is the low photosynthetic temperature sensitivity in comparison with culture plants. The apparent CO2 intake of the apricot for example dropped to the compensation point already at 25 deg C while all examined wild plants at this temperature still exhibited a considerable photosynthetic gain. This is maintained up to 40 and even 50 deg C. For desert plants the important criterion is that their yearly metabolic gain reach a certain level sufficient for the maintenance and growth of the vegetative body.--Copyright 1972, Biological Abstracts, Inc.
W73-03866

STUDY OF LENGTHWISE GROWTH OF TERMINAL BRANCHES OF ERICA MULTIFLORA L. IN SOME LOCALITIES OF PROVENCE (SOUTHERN FRANCE),
Aix-Marseille Univ., Marseille (France). Faculte des Sciences.
G. Aubert.
Ann Fac Sci Marseille. 42: p 165-192. 1969. Illus. Maps.
Identifiers: *Erica-Multiflora-D, *France, Growth (Flora), Lengthwise growth, Precipitation, Provence (France), Soils, Statistical studies.

A statistical study was made using about 5000 measurements. Precipitation records and soil must be considered in establishing relationships between environment and growth.--Copyright 1972, Biological Abstracts, Inc.
W73-03867

ECOLOGICAL AND PHYSIOLOGICAL INVESTIGATIONS OF GROUND VEGETATION IN ARID REGIONS OF THE USSR (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
V. M. Sveshnikova.
Ekologiya. Vol 1, No 4, p 19-24. 1970.
Identifiers: Adaptation, *Arid regions (USSR), Carbohydrate, Drought, Ecological studies, *Metabolism, Physiological studies, Temperature, USSR, *Vegetation (Ground).

Synthetic processes predominate and sucrose plays an especially noticeable role in the overall process of carbohydrate metabolism. Enhanced synthesis of hemicellulose apparently plays the main role in adaptive reactions to drought and high temperatures. During a drought the enzymic activity of plants is directed toward hydrolytic processes.--Copyright 1972, Biological Abstracts, Inc.
W73-03868

BIOCENOSIS OF THE PERUVIAN MANGROVES (IN SPANISH),
Universidad Nacional Agraria, La Molina (Peru). Departamento de Biologia.
G. M. Pena.
An Cient (La Molina). Vol 9, No 1/2, p 38-45. 1971. Illus. English summary.
Identifiers: *Biocenosis, Cephalochordates, Crustaceans, Echinoderms, Fish, *Mangroves, Mollusks, *Peruvian mangroves.

Different biotopes and their subdivisions typical of the Peruvian mangroves located in the Department of Tumbes in the northern part of Peru are presented. When the biotopes are described, the biologic characteristics, the species and community composition are given delimiting the scope of the present study. In the different mangrove biotopes 85 spp. were collected which comprise fishes, cephalochordates, echinoderms, mollusks and crustaceans.--Copyright 1972, Biological Abstracts, Inc.
W73-03869

MICRODISTRIBUTION OF BENTHIC INVERTEBRATES IN STREAMS OF THE CENTRAL PYRENEES (IN FRENCH),
Toulouse Univ. (France). Lab. of Hydrobiology.
P. Lavandier, and J. Dumas.
Ann Limnol, Vol 7, No 1, p 7-23, 1971, English summary.
Identifiers: *Benthic invertebrates, *Distribution (Invertebrates), *France, Invertebrates, Mosses, *Pyrenees, Streams.

The influence of various factors of the habitat on the distribution of some species was studied in 3 small streams of the Central Pyrenees. For each species, 3 groups of substrates--preferred, indifferent or avoided--were determined. For each group the various substrates are listed by order of preference. The role of the current was studied by means of a Chi square test. Most of the species considered lived and developed well in the current. Of all the substrates mosses supported the largest and most diversified associations. Many species moved from 1 substrate to another during their life-cycle.--Copyright 1972, Biological Abstracts, Inc.
W73-03871

EFFECTS OF SOME RESPIRATORY INHIBITORS ON WATER FLUX IN ROOT HAIRS OF AVENA SATIVA,
Montreal Univ. (Quebec). Dept. of Biological Sciences.
M. Ahmad, and M. Cailloux.
Can J Bot. Vol 50, No 3, p 575-579. 1972. Illus.
Identifiers: *Avena-Sativa-M, Flux, Potassium cyanide, *Respiratory inhibitions, Roots, Sodium azide, Sodium fluoride, *Metabolism.

Effects of potassium cyanide, sodium azide, and sodium fluoride on water uptake by root hairs of Avena sativa were investigated. Low concentrations (2 x .000001 and 2 x .00001 M) of potassium cyanide accelerate the velocity of water uptake; a decline in the magnitude of water uptake is observed at 2 x .0001 M and 55% inhibition at 2 x .001 M. Azide and fluoride, on the other hand, convert excretion into absorption when applied at low concentrations (3 x .0001 M and 6 x .000001 M, respectively) while at increased inhibiting concentrations absorption may be converted into excretion without causing the death of the root hairs. The evidence presented strongly suggests an intimate relationship between respiratory metabolism and absorption of water.--Copyright 1972, Biological Abstracts, Inc.
W73-03893

2J. Erosion and Sedimentation

OYSTER REEF SEDIMENTATION, BILOXI BAY AREA, MISSISSIPPI,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 02L.
W73-03264

A MATHEMATICAL MODEL OF THE PHYSICAL PROCESSES OF AN EARTHFLOW,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
M. J. Cunningham.
Journal of Hydrology (New Zealand), Vol 11, No 1, p 47-54, 1972. 7 fig, 2 ref.

Descriptors: *Mathematical models, *Mudflows, Mass wasting, Landslides, Erosion, Slopes, Viscosity, Model studies.

It is postulated that an earthflow behaves as if it were a highly viscous fluid. The consequences of this hypothesis are worked out by means of a mathematical model which predicts velocity profiles through a flow, and rates of erosion. The model flow is very wide and is of uniform depth down a slope of angle. In this case the flow is essentially nonenclosed laterally and side effects can be ignored. Additional assumptions are made for the sake of mathematical simplicity: (a) the velocity is zero at some depth; (b) viscosity and density are constant at all points in the flow; (c) the mud is a newtonian fluid; and (d) the flow is irrotational, and very slow. (Knapp-USGS)
W73-03281

THE DISTRIBUTION AND ORIGIN OF PHOSPHATE IN SEDIMENTS OFF NORTHWEST AFRICA,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
C. P. Summerhayes, A. H. Nutter, and J. S. Tooms.
Sedimentary Geology, Vol 8, No 1, p 3-28, August 1972. 16 fig, 2 tab, 43 ref.

Descriptors: *Bottom sediments, *Africa, *Sands, *Phosphates, *Provenance, Placer mining, Sedimentology, Sedimentation, Stratigraphy, Radioactive dating, Mineralogy, Particle size.

The unconsolidated sediments on the continental shelf and uppermost continental slope off Morocco and the Spanish Sahara are sands, silty sands, and silts. Their sand fraction is carbonate-rich and considered to be mainly relict from Pleistocene times when sea level was lower. This relict sand is mixed with, and locally buried by, Holocene detrital silts which are concentrated on the slope and the middle shelf. Phosphate is locally abundant in the form of sand-sized detrital grains. These were derived from Cretaceous and Tertiary phosphatic rocks cropping out on the shelf, by erosion during the Pleistocene. The sand-sized phosphatic detritus is concentrated in relict placer-type deposits near parent-rock outcrops. Longshore transport during the Pleistocene has contributed further concentrations of phosphatic sand along the shelf edge. These deposits are of low grade (less than 8% P205) and are of no economic interest at present. No signs of Recent phosphate mineral formation were noted. Thus, the hypothesis that this phenomenon is linked with the upwelling of nutrient-rich water does not appear to apply, at this time, to the region studied. (Knapp-USGS)
W73-03283

GRAIN-SIZE DISTRIBUTION, CARBONATE CONTENT AND HEAVY MINERALS IN EOLIAN SANDS, SOUTHERN DESERT, IRAQ,
Ustredni Ustav Geologicky, Prague (Czechoslovakia).
V. Skocek, and A. A. Saadallah.
Sedimentary Geology, Vol 8, No 1, p 29-46, August 1972. 7 fig, 4 tab, 29 ref.

Descriptors: *Carbonates, *Sands, *Particle size, *Provenance, *Dune sands, Mineralogy, Aeolian soils, Deserts, Sedimentation, Dunes, Sediment transport, Tracers, Winds.
Identifiers: *Iraq, *Heavy minerals, *Eolian sands.

Eolian sands which accumulated along the eastern margin of the Iraq Southern Desert show variable grain-size distributions. Samples from different parts of a dune have distinctly different amounts of the three basic genetic populations of clastic grains. Bimodal grain-size distribution is relatively widespread. The origin of bimodal distribution is explained by the infiltration of fine fractions transported by dust storms. The variation of the statistical parameters is in contrast with the previously reported low variability of these parameters in eolian sands. Carbonate content is variable, reaching a maximum of 30%. Carbonate is concentrated in the finest fraction, which is derived from alluvial sediments and desert soils. The association of heavy minerals in eolian sands is characterized by large amounts of opaque and unstable minerals of the hornblende, epidote, and pyroxene groups. The local accumulation of celestite is remarkable. The association of heavy minerals is generally similar to that of sediments of the Lower Mesopotamian Plain, which were probably the main source of eolian clastics. (Knapp-USGS)
W73-03284

DISTINCTION OF ELEMENTARY SAND POPULATIONS IN THE GIRONDE ESTUARY (FRANCE) BY R-MODE FACTOR ANALYSIS OF GRAIN-SIZE DATA,
Institut de Geologie du Bassin d'Aquitaine, Talence (France).
For primary bibliographic entry see Field 02L.
W73-03287

OBSERVATIONS ON DUNES AND BI-MODAL SANDS IN THE TENERE DESERT,
University Coll., London (England). Dept. of Geography.
A. Warren.
Sedimentology, Vol 19, No 1-2, p 37-44, September 1972. 7 fig, 21 ref.

Descriptors: *Particle size, *Dune sands, *Wind erosion, *Sediment transport, Dunes, Statistics, Statistical methods, Bed load, Suspended load, Saltation, Winds, Africa.
Identifiers: *Tenere Desert (Niger).

Dune patterns in the central Tenere Desert, Niger, reveal a significant association between different dune morphologies and sand types. It is suggested that the bimodal sands that are associated with low dunes and flat areas can be explained by the protection of fine sands in the inter-particle voids of the coarse creep fraction. (Knapp-USGS)
W73-03288

STABLE-ISOTOPE INVESTIGATIONS OF SEDIMENTS FROM THE DSDP III CRUISE TO SOUTH ATLANTIC,
Shell Development Co., Houston, Tex. Exploration and Production Research Div.
R. M. Lloyd, and K. J. Hsu.
Sedimentology, Vol 19, No 1-2, p 45-58, September 1972. 8 fig, 1 tab, 13 ref.

Descriptors: *Bottom sediments, *Atlantic Ocean, *Carbonate rocks, *Diagenesis, *Isotope studies, Dolomite, Water chemistry, Deposition (Sediments), Limestones, Oxygen isotopes, Stable isotopes, Carbon, Carbonates, Isotope fractionation, Water chemistry.

Ten samples of sediments and sedimentary rocks collected during the Deep Sea Drilling Project Leg III cruise to South Atlantic were analyzed for oxygen and carbon isotope abundances. These samples include dolomitic chert, Braarudosphaera chalk, stiff pelagic chalk ooze, biosparitic coquina and a white marble near a basalt contact. The oxygen and carbon isotope ratios provide clues and place limitations on speculations regarding the genesis and diagenesis of the samples in question. The generation of the Oligocene Braarudosphaera chalk in the South Atlantic was probably related to the upwelling of very cold antarctic waters. The biosparitic Cretaceous coquina on the Rio Grande Rise was cemented under submarine conditions. The marble between the basalt and overlying ooze is not contact metamorphic, but was crystallized at a normal deep-marine temperature of about 4.5 deg C. (Knapp-USGS)
W73-03289

EXPERIMENTS ON THE ORIGIN OF FLASER, LENTICULAR AND SAND-CLAY ALTERNATING BEDDING,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands).
J. H. J. Terwindt, and H. N. C. Breusers.
Sedimentology, Vol 19, No 1-2, p 85-98, September 1972. 7 fig, 1 tab, 10 ref.

Descriptors: *Deposition (Sediments), *Sedimentary structures, *Mud, *Deltas, *Stratification, *Sediment transport, Shear drag, Shear strength, Mud-water interfaces, Scour, Sedimentation, Tides, Tidal streams, Tidal waters, Beds (Stratigraphic), Suspended load, Bed load.
Identifiers: Flaser bedding, Lenticular bedding.

In Dutch subtidal waters, mud settling from suspension can produce a layer with a thickness of only a few millimeters in one slack-water period. However, consolidated mud layers of 10-25 mm thickness in subtidal deposits are often observed. This indicates that mud may be preserved over several slack-water periods. This is only possible if the critical shear velocity (U) for the initiation of sediment movement is not surpassed after slack water. Tube and flume experiments were used to study this relationship. Thicker mud layers have smaller initial consolidation rates and lower values of U. A higher sand content in the mud always gives a more rapid initial consolidation. The U values increase to a maximum which is reached at a sand content of 40%. Higher sand contents lead to decreasing values of U. For one particular mud sample the U values increase linearly with the mud concentration of the bed material. After three hours of consolidation a mud layer may carry a sharply bounded sand layer 0.5 cm thick. By application of the results of the experiments to natural conditions in tidal water some explanations are possible of the formation of flaser, lenticular and sand–clay alternating bedding. (Knapp-USGS)
W73-03290

ARAGONITIC OOIDS: EXPERIMENTAL PRECIPITATION FROM SEAWATER IN THE PRESENCE OF HUMIC ACID,
Kiel Univ. (West Germany). Geological-Paleontological Inst.
E. Suess, and D. Futterer.
Sedimentology, Vol 19, No 1-2, p 129-139, September 1972. 6 fig, 1 tab, 34 ref.

Descriptors: *Sedimentation, *Chemical precipitation, *Humic acids, *Calcium carbonate, Mineralogy, Crystallography, Carbonates, Deposition (Sediments), Sedimentary structures.
Identifiers: *Aragonite, *Ooids.

Humic acid dissolved in artificial seawater influenced the morphology, internal structure, and composition of aragonite when precipitation was induced with dilute Na2CO3 solution. At sodium humate concentrations of around 20 mg/liter, numerous brownish spherical aragonite bodies developed within one day at 25 deg C. The spheres ranged in size from 10-100 microns and resembled natural marine ooids. They formed with gentle agitation of the solution as well as with no water movement at all. The typical structure of natural ooids consisting of concentric alternating aragonite and organic laminae was experimentally duplicated as layers of aragonite crystals alternating with humate membranes; however, in contrast to natural ooids, the individual aragonite crystals here were oriented radially with their c-axes. The aragonite of the spheres contained about 20 wt % more strontium than the aragonite precipitated experimentally without the addition of sodium humate, and organic carbon content of the spherical aragonite was about 5% by weight. (Knapp-USGS; W73-03291

NEARSHORE GLACIAL-MARINE DEPOSITION FROM MODERN SEDIMENTS OF THE WEDDELL SEA,
Hope Coll., Holland, Mich. Dept. of Geology.
J. B. Anderson.
Nature Physical Science, Vol 240, No 104, p 189-192, December 25, 1972. 4 fig, 1 tab, 10 ref.

Descriptors: *Bottom sediments, *Antarctic, *Sedimentation, *Glaciation, *Ice cover, Icebergs, Sedimentology, Sediment transport, Sea ice, Glaciers, Stratigraphy, Paleoclimatology, Benthic fauna.
Identifiers: *Weddell Sea.

Modern antarctic marine deposits reflect contrasting glacial and oceanographic conditions in their sedimentologic and faunal distributions. There is evidence that both dry-base (freezing) and wet-base (thawing) ice shelves presently exist in the Weddell Sea. Saline shelf waters formed by a freezing Ronne Ice Shelf are the dominant water mass of the southwestern continental shelf. At the southwestern continental slope these dense shelf waters mix with warm deep waters to form Antarctic Bottom Water. (Knapp-USGS)
W73-03292

AVERAGE TRANSPORT CAPACITY OF AN ALLUVIAL RIVER,
Calcutta Port Commissioners (India).
S. K. Bhattacharya, and A. N. Biswas.
Institution of Civil Engineers, Proceedings, Vol 53, Part 2, p 65-75, June 1972. 7 fig, 1 tab, 12 ref.

Descriptors: *Sediment discharge, *Alluvial streams, *Analysis, Sedimentation, Bed load, Floodwater, Methodology, Sediment distribution, *Sediment transport, Sedimentation rates, Sediment load, On-site investigations, Measurement, Computation, Discharge measurement, Frequency curves.
Identifiers: India, Einstein procedure, Shear forces, Sediment concentration.

An extensive program of measurements was undertaken for study of sedimentation and shoaling characteristics of the Bhagirathi-Hooghly River System (India). A method for determining average sediment transport capacity was develop from an Einstein-type formula. Since transport capacities vary from section to section, the use of a large number of sections located over a long length of the river is discussed. The procedure used on the Bhagirathi considered: (1) a 50-mi length of river channel; (2) cross sections located in straight sections away from bends; (3) an average bed material size distribution curve obtained from samples collected during freshets; (4) gage discharge curves prepared for sections at 10-mi intervals; and (5) water surface profiles computed for discharges of 20,000 to 59,000 cfs. Computed rating curves comparing sediment load in tons per day with river discharge show an exponential relationship similar to the measured suspended load-discharge relationship. Frequency analyses were made for discharges from 5,000 to 75,000 cfs at 5,000 cfs intervals. Measured load was higher than computed load below 40,000 cfs, but approached the curve above 40,000 cfs. Conclusions support analyses that consider transport capacity for a river reach instead of individual sections. (USBR)
W73-03306

SEDIMENT TRANSPORT IN A MISSISSIPPI RIVER DISTRIBUTARY--BAYOU LAFOURCHE, LOUISIANA,
Geological Survey, Washington, D.C.
W. H. Doyle, Jr.
Available from GPO, Washington, DC 20402 - Price 40 cents. Geological Survey Water-Supply Paper 2008, 1972. 48 p, 35 fig, 3 tab, 44 ref.

Descriptors: *Sedimentation, *Sediment transport, *Sediment control, *Channel flow, *Louisiana, Sediment discharge, Sediment yield, Sediment distribution, Analytical techniques, Sampling, Cross-sections, Equations, Channel morphology.
Identifiers: *Bayou Lafourche (La).

The installation of a pumping plant at Donaldsonville, La., in 1955 to solve a water-supply problem for the residents along Bayou Lafourche created a sedimentation problem in the bayou. Prior to 1904, when the bayou functioned as a distributary, floodflows periodically scoured the sediment deposited in the channel at lower stages. Nearly constant flows maintained by the pumping plant result in limited transport capacity to move the sediment imposed on the channel. A gamma probe was used to determine that 311,000 tons has been deposited in the upper part of the bayou since the pumping plant went into operation. The reach used in this study was a 12.5-mile section of Bayou Lafourche beginning at Donaldsonville, La., and extending to Plattenville, La. A prediction equation was derived to determine the rate of sediment accumulation. A second prediction equation was derived to determine the amount of sediment accumulation between 1955 and 1966 at each cross section in the study reach. The correlation coefficients for the equations were 0.82 and 0.95, respectively. A comparison of former channel cross sections with the present cross sections enabled the determination of the characteristics of a stable cross section. The stable channel characteristics were used to design the study reach for stability. Stability, as used here, is the channel cross section and slope that will permit passage of the total sediment inflow without significant scouring or deposition. (Woodard-USGS)
W73-03407

HYDROGEN AND OXYGEN ISOTOPE SYSTEMATICS IN WEATHERING PROFILES,
California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
For primary bibliographic entry see Field 02K.
W73-03409

FLOOD OF OCTOBER 5-10, 1970 IN PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 02E.
W73-03413

CONTROL OF MERCURY CONTAMINATION IN FRESHWATER SEDIMENTS,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05D.
W73-03517

FORMS OF SEDIMENT ACCUMULATION IN THE BEACH ZONE,
Massachusetts Univ., Amherst. Coastal Research Center.
M. O. Hayes, V. Goldsmith, and C. H. Hobbs, III.
Available from NTIS, Springfield, Va 22151 as AD-744 316 Price $3.00 printed copy; $0.95 microfiche. Technical Report No 2-CRC, June 1972. 58 p, 22 fig, 23 ref. NR 388-084. ONR Contract N00014-67-A-0230-0001.

Descriptors: *Sedimentation, *Beaches, *Sands, *Sediment transport, *Sedimentology, Investigations, Beach erosion, Data collections, Erosion control, Sediment control, Berms, Currents (Water), Storms, Tidal effects, Slopes, Topography, New England, Alaska, North Carolina, Oceans, Lake Michigan.

The shape and distribution of the different forms of sand accumulation that occur in the beach zone is approached from a descriptive, geomorphological point of view with examples from the shorelines of New England, Alaska, North Carolina, and Lake Michigan. Forms of sediment accumulation in the beach zone include ridge-and-runnel systems, berms, a multiplicity of types of nearshore bars, cusp-type sand waves (or rhythmic topography), complex sand bodies affiliated with ebb-tidal deltas, and an ordered system of minor features (bedforms) that correlate with flow-regime conditions. Most sand beaches undergo a simple cycle of erosion and deposition in response to the passage of coastal storms. The primary mode of sediment transport shoreward after storms is landward migration of ridge-and-runnel systems. Cusp-type sand waves migrate parallel with the shore in the direction of longshore drift at different rares, depending upon the size of the features, the local wave climate, and probably the grain size of the sediment. At Cape Hatteras, North Carolina, they migrate at rates averaging between 100 and 200 m per year. Normally, the forms of accumulation associated with ebb-tidal deltas consist of: (a) a lunate, subaqueous sand sheet deposited seaward of the main channel by ebb currents; (b) linear sand bars paralleling the main channel; and (c) swash bars. (Woodard-USGS)
W73-03734

SEDIMENT TRANSPORT IN THE WESTERN TRIBUTARIES OF THE SACRAMENTO RIVER, CALIFORNIA,
Geological Survey, Washington, D.C.
B. L. Jones, N. L. Hawley, and J. R. Crippen.
Available from GPO, Washington, DC 20402 - Price $0.25 (paper cover). Geological Survey Water-Supply Paper 1798-J, 1972. 27 p, 5 fig, 5 tab, 28 ref.

Descriptors: *Sediment transport, *Sediment discharge, *Sediment yield, *Sediment control, *California, Streams, Streamflow, Sediment distribution, Suspended load, Bed load, Reservoirs, Data collections, Methodology, Sampling.
Identifiers: *Sacramento River (Calif).

Sediment transport studies were made on the western tributaries of the Sacramento River, California, from Clear Creek in the north to Putah Creek in the south. The streams drain an area of more than 7,000 square miles. Major impoundments in the area have a combined storage capacity of about 2.5 million acre-feet, and proposed impoundments would add 3-7.5 million more acre-feet of storage. About 960,000 acre-feet of water is imported to the region from the Trinity River annually, and plans call for the annual importation in the future of 700,000-950,000 acre-feet from the Eel River basin. Most of this imported water will be conveyed to areas of water deficiency south of the study area. The quantity of sediment carried by streams and deposited by them may affect both the quality of water and the operational regimen of reservoirs. Because of these possible problems, data on sediment transport have been analyzed to provide planners and engineers with estimates of the quantities involved in the fluvial sediment processes of the study area. Total average annual yield of suspended sediment from the study area is about 4.7 million tons. Approximately 30% is retained by entrapment as deposits in lakes and reservoirs within the region; the remaining 70% is transported from the regions, most of it during relatively short periods of high streamflow. (Woodard-USGS)
W73-03742

EFFECT OF PHYSICAL AND CHEMICAL PROPERTIES ON ERODIBILITY OF SOME SOILS OF MALWA PLATEAU,
Mississippi State Univ., State College. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W73-03899

2K. Chemical Processes

THE DISTRIBUTION AND ORIGIN OF PHOSPHATE IN SEDIMENTS OFF NORTHWEST AFRICA,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 02J.
W73-03283

THE ISOTOPIC COMPOSITION OF OXYGEN AND HYDROGEN IN SOME BRINES FROM THE MESOZOIC IN NORTH-WEST POLAND,
Instytut Balneoklimatyczny, Poznan (Poland).
J. Dowgiallo, and E. Tongiorgi.
Geothermics, Vol 1, No 2, p 67-69, June 1972. 2 fig, 1 tab, 4 ref.

Descriptors: *Brines, *Water chemistry, *Geochemistry, *Connate water, *Isotope studies, Water circulation, Salinity, Mineral water, Salts, Europe.
Identifiers: *Poland.

The isotopic composition of waters in the brines of Poland suggests that the brines derive from fossil waters, with notable saline content, diluted with various amounts of recent meteoric waters. It might also be possible that the water of the most concentrated brines could have got its actual chemical composition as a result of filtering through semi-permeable clay membranes separating the more permeable strata. (Knapp-USGS)
W73-03285

STABLE-ISOTOPE INVESTIGATIONS OF SEDIMENTS FROM THE DSDP III CRUISE TO SOUTH ATLANTIC,
Shell Development Co., Houston, Tex. Exploration and Production Research Div.
For primary bibliographic entry see Field 02J.
W73-03289

ARAGONITIC OOIDS: EXPERIMENTAL PRECIPITATION FROM SEAWATER IN THE PRESENCE OF HUMIC ACID,
Kiel Univ. (West Germany). Geological-Paleontological Inst.
For primary bibliographic entry see Field 02J.
W73-03291

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 12-16. NORTH PACIFIC SLOPE BASINS, ALASKA, AND HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-03293

ISOLATION OF HUMIC SUBSTANCES FROM SWAMP WATERS,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05A.
W73-03297

INFLUENCE OF HYDRAULIC STRUCTURES ON THE OXYGEN CONTENT IN THE WATERS OF THE VOLGA IN WINTER,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05A.
W73-03298

STUDY OF ORGANIC MATTER IN NATURAL WATERS BY MEANS OF LUMINESCENCE,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05A.
W73-03302

METHOD OF PREPARING DRY RESIDUE FROM WATER WITH A LOW MINERAL CONTENT FOR SPECTRAL ANALYSIS,
Akademiya Nauk SSR, Moscow. Institut Biologii Vnutrennykh Vod.
G. V. Kol'tsov, and I. S. Il'in.
Available from NTIS Springfield, Va 22151 as TT69-55032. Price $3.00 paper copy. In: Production and circulation of organic matter in inland waters; TT69-55032, Israel Program for Scientific Translations, Jerusalem, p 87-90, 1969. 3 fig, 1 tab, 3 ref. (Originally published as Trudy Instituta Biologii Vnutrennikh Vod, No 13 (16); Izdatel'stvo 'Nauka', Moscow, 1966.)

Descriptors: *Analytical techniques, *Water analysis, *Water sampling, *Equipment, Evaporation, Heating.
Identifiers: USSR.

A method was developed for preparing dry residue for semiquantitative and quantitative analysis of water with a low mineral content. The method provides for automatic water flow and ensures a high degree of purity and precision. The maximum difference between duplicate samples of dry residue from 1 liter of solution at concentrations of 100-300 mg/liter is mo more than 1 mg. (Josefson-USGS)
W73-03304

DIFFUSION OF SEA WATER IONS--I. DIFFUSION OF SEA WATER INTO A DILUTE SOLUTION,
California Univ., Los Angeles. Dept. of Geology.
S. Ben-Yaakov.
Geochimica et Cosmochimica Acta, Vol 36, No 12, p 1395-1406, December 1972. 4 fig, 3 tab, 26 ref.

Descriptors: *Diffusion, *Sea water, *Water chemistry, *Ion transport, *Ion exchange, Electrolytes, Aqueous solutions, Chemical potential, Pore water, Diagenesis, Connate water.

A model of diffusion by Vinograd and McBain was applied to explain ionic diffusion out of sea water and into dilute solution. Models so constructed were found to be compatible with experimental data. Ionic interaction resulting from electroneutrality requirement may extensively modify fluxes of diffusing ions and may also affect the relative distribution of both migrating and nonmigrating ions. A change in the cation/chloride ratio in interstitial waters of marine sediments does not necessarily imply that the ion involved in a chemical reaction or that it migrates. (Knapp-USGS)
W73-03408

HYDROGEN AND OXYGEN ISOTOPE SYSTEMATICS IN WEATHERING PROFILES,
California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.
J. R. Lawrence, and H. P. Taylor, Jr.
Geochimica et Cosmochimica Acta, Vol 36, No 12, p 1377-1393, December 1972. 9 fig, 2 tab, 13 ref. NSF Grant GA-12945.

Descriptors: *Weathering, *Stable isotopes, *Soil formation, *Isotope studies, Isotope fractionation, Clay minerals, Deuterium, Oxygen isotopes, Mineralogy.

Studies were undertaken of deuterium and 0-18 in the weathering of seven different soil profiles developed on both igneous and sedimentary parent rocks. Parent rock minerals in soils do not undergo appreciable oxygen or hydrogen isotopic exchange with meteoric waters in the weathering environment. The oxygen isotopes of quartz, biotite and feldspar exhibit no change from fresh rock to the A-horizons in any of these soils. The bulk oxygen isotope ratio and D/H ratio of soils formed on shales containing montmorillonite and illite exhibit little or no change relative to the parent rock shale so long as no significant mineralogical changes have occurred. Clay minerals and hydroxides produced during weathering may attain drastically different isotopic compositions than those of the parent rocks, and these weathering products form essentially in isotopic equilibrium with their local meteoric waters. Complications arise in the case of halloysite because of isotopic exchange between the interlayer water and hydroxyl. The D/H ratios of halloysite are thus not preserved and give no information concerning the conditions of formation of the halloysite soil. (Knapp-USGS)
W73-03409

HYDROGEOCHEMISTRY OF THE SURFACE WATERS OF THE MACKENZIE RIVER DRAINAGE BASIN, CANADA--III. STABLE ISOTOPES OF OXYGEN, CARBON AND SULPHUR,
Research Council of Alberta, Edmonton.
B. Hitchon, and H. R. Krouse.
Geochimica et Cosmochimica Acta, Vol 36, No 12, p 1337-1357, December 1972. 7 fig, 4 tab, 52 ref.

Descriptors: *Geochemistry, *Hydrogeology, *Stable isotopes, *Water chemistry, Water analysis, Oxygen, Carbon, Sulfur, Canada, Evaporation, Isotope fractionation, Isotope studies.
Identifiers: *Hydrogeochemistry, Mackenzie River basin (Canada).

Surface waters from the Mackenzie River drainage basin, Canada, were collected in the summer of 1969. The samples represent an instant in time during a period of average flow for most rivers in the basin. Stable isotopes of oxygen were determined on all these waters. Regional variations of 0-18, when compared to the distribution of runoff (as a percentage of total precipitation) and of mean summer daily isotherms, suggest that the main factor controlling the 0-18 content is the amount of evaporation to which they are subjected during both precipitation and runoff. Factor analysis was used to evaluate the relations among 14 chemical variables and the stable isotope ratio of carbon in dissolved bicarbonate for 67 samples of surface water. The sources of carbon are pre-existing bicarbonate from the weathering of minerals with a subsequent dominant isotope effect from exchange of carbon isotopes with biogenic carbon dioxide. This effectively masks the carbon isotopic composition of the pre-existing bicarbonate except as revealed by factor analysis. The ratio of stable isotopes of sulphur in dissolved sulfate was measured on 52 surface waters, which fall naturally into three major groups according to the geology of the subbasins: (1) evaporites exposed or influenced by saline springs; (2) Paleozoic strata (with or without igneous rocks); and (3) marine Cretaceous rocks. The first two groups are characterized by positive S-34 values with variable contents of sulfate indicating a source of sulfate from gypsum and the third group by negative S-34 values with low contents of sulfate probably indicative of the effects of microbiological fractionation. (See also W73-03411) (Knapp-USGS)
W73-03410

HYDROGEOCHEMISTRY OF THE SURFACE WATERS OF THE MACKENZIE RIVER DRAINAGE BASIN, CANADA --IV. BORON--SALINITY-CLAY MINERALOGY RELATIONSHIPS IN MODERN DELTAS,
Calgary Univ. (Alberta). Dept. of Geology.
F. J. Dewis, A. A. Levinson, and P. Bayliss.

Geochimica et Cosmochimica Acta, Vol 36, No 12, p 1359-1375, December 1972. 9 fig, 2 tab, 32 ref. NRCC Grant No A-4383.

Descriptors: *Geochemistry, *Clay minerals, *Pore water, *Boron, *Salinity, Stratigraphy, Deltas, Sedimentation, Sedimentology, Connate water, Canada, Regression analysis, Water chemistry, Hydrogeology.
Identifiers: *Mackenzie River basin (Canada), *Hydrogeochemistry.

Bulk sediment samples from two northern Alberta fresh water deltas and from the marine Mackenzie River delta were analyzed for mineralogy and the trace elements B, Cu, Zn, Ni, Li, and Mn. In both the marine and fresh-water deltas the total clay content of the samples correlates highly with the trace elements studied. The concentrations of B and total clay in the bottom sediments from all three deltas increases with distance from the mouth of each delta. The trace element variations in the two fresh-water deltas result from variations in total clay content. The boron contents of the fresh-water deltas are similar to those reported for modern and ancient marine deltas. Boron adsorption from sea water is not a significant factor in controlling the boron content of sediments in the marine Mackenzie River delta. Discriminant function analysis shows that the mineralogical and chemical differences of the samples can be explained better by variations in the source area rather than by their occurrence in either the fresh-water or marine deltas. The low water temperature of the Mackenzie River delta environment and low silica content of the Mackenzie River may be factors in the small boron increase in the marine delta for an alternative adsorption explanation. The boron content of shales and other fine-grained sediments may be useful to determine distance from a strand line, but its usefulness as an indicator of pale salinity is questionable. (See also W73-03410) (Knapp-USGS)
W73-03411

PALEOTEMPERATURES AND OTHER HYDROLOGICAL PARAMETERS DEDUCED FROM NOBLE GASES DISSOLVED IN GROUNDWATERS; JORDAN RIFT VALLEY, ISRAEL,
Israel Atomic Energy Commission, Rehovoth; and Weizmann Inst. of Science, Rehovoth (Israel).
E. Mazor.
Geochimica et Cosmochimica Acta, Vol 36, No 12, p 1321-1336, December 1972. 6 fig, 8 tab, 26 ref.

Descriptors: *Paleoclimatology, *Water chemistry, *Hot springs, *Gases, *Thermal water, Helium, Argon, Krypton radioisotopes, Mass spectrometry, Hydrogeology.
Identifiers: *Jordan Valley (Israel), Noble gases, *Israel.

Thermal waters from the Jordan Valley, Israel, were analyzed mass spectrometrically for their dissolved He, Ne, Ar, Kr and Xe. The isotopic abundances of the four heavier gases equal those of air-equilibrated waters at 15-22 deg C. The thermal waters studied originated from meteoric waters that entered the ground. When they entered the ground (up to 30,000 years ago according to C-14 dating) the average temperature in the region was close to the present one, around 19 deg C. The dissolved noble gases were not lost in the ground although the waters were heated up to 63 deg C for thousands of years. The present data support the reliability of the noble gas method for determining original surface paleotemperatures of ancient meteoric waters. Radiogenic He excess is a potential indicator for ancient waters along with Ra excess and low C-14 contents. (Knapp-USGS)
W73-03412

GEOCHEMICAL SURVEY OF WATER,
Geological Survey, Rolla, Mo.
G. L. Feder.
In: Geochemical Survey of Missouri-Plans and progress for sixth six-month period (January-June, 1972); Geological Survey Open-file Report, p 80-86, 1972. 2 tab.

Descriptors: *Geochemistry, *Water chemistry, *Geology, *Trace elements, *Missouri, Chemical analysis, Rocks, Groundwater, Chemical reactions, Geologic formations, Correlation analysis, Zinc, Boron, Sandstones, Limestones, Shales, Dolomite, Geologic time, Sulfides.

A geochemical survey of rocks and water is summarized for three geohydrologic areas (strata of Pennsylvania age, Mississippian age, and Ordovician age) in Missouri. A few trace elements, notably zinc, suggest the presence of an inverse relation between abundance in rock and abundance in groundwater. Even though the Pennsylvanian age strata have an appreciably higher concentration of zinc than strata of Cambrian and Ordovician age, the groundwaters in the Pennsylvanian strata are lower in zinc. Evidently, the low Eh and the presence of H2S in the groundwater of the Pennsylvanian strata sharply reduces the solubility of zinc in comparison to its solubility in the relatively high Eh waters in the Cambrian and Ordovician strata. Due to the generally low solubilities of sulfides of the transition metals, and aquifer containing fresh water (less than 1,000 mg/liter dissolved solids) that has a significant concentration of H2S contains very low concentrations of these elements in solution even though they may be abundant in the aquifer rocks. (Woodard-USGS)
W73-03418

GEOTHERMAL PROSPECTS IN NEW MEXICO,
New Mexico Bureau of Mines and Mineral Resources.
For primary bibliographic entry see Field 03B.
W73-03428

HYDROGRAPHIC DATA FROM OREGON WATERS, 1971,
Oregon State Univ., Corvallis. School of Science; and Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 07C.
W73-03447

IDENTIFICATION OF POLYCHLORINATED BIPHENYLS IN THE PRESENCE OF DDT-TYPE COMPOUNDS.
National Environmental Research Center, Cincinnati, Ohio. Analytical Quality Control Lab.
For primary bibliographic entry see Field 05A.
W73-03515

A SURVEY OF THE SUBSURFACE SALINE WATER OF TEXAS, VOLUME I,
Core Labs., Inc., Dallas, Tex.
For primary bibliographic entry see Field 07C.
W73-03524

THE EFFECTS OF ETHANOL-WATER AND DIMETHYL SULFOXIDE-WATER SOLVENT SYSTEMS ON THE CONDUCTIVITY OF HYDROCHLORIC ACID, SODIUM HYDROXIDE, AND POTASSIUM CHLORIDE,
Southwest Texas State Univ., San Marcos. Dept. of Chemistry.
B. J. Yager, and T. W. Cowley.
The Texas Journal of Science, Vol 23, No 1, p 89-96, October, 1971. 1 tab, 4 fig, 9 ref.

Descriptors: *Chemical analysis, *Chemical properties, *Water chemistry, *Conductivity, *Electrolytes, *Electrolysis, *Electrochemistry, Chemistry, Solvation, Solvents, Aqueous solutions, Polyelectrolytes, Cations.

The effect of solvents on reaction rates has received considerable attention in recent years. Such parameters as dielectric constant, nucleophilicity, and ionizing power have been used in attempts to correlate solvent properties with their effect on reaction rates. The equivalent conductance at infinite dilution of hydrochloric acid, sodium hydroxide, and potassium chloride were measured in dimethyl sulfoxide-water and ethanol-water mixtures in which the organic phase was varied from 0 to 50 percent by volume. The added ethanol decreased the conductance of the sodium hydroxide to a greater extent than that of the other 2 electrolytes. This is contrary to the theory of selective solvation of cations by aprotic solvents. (Black-Arizona)
W73-03605

METHODS IN AQUATIC MICROBIOLOGY,
For primary bibliographic entry see Field 05A.
W73-03699

APPLICATIONS OF THE LOGNORMAL FREQUENCY DISTRIBUTION TO THE CHEMICAL COMPOSITION AND SIZE DISTRIBUTION OF NATURALLY OCCURRING ATMOSPHERIC AEROSOLS,
National Center for Atmospheric Research, Boulder, Colo.
I. H. Blifford, Jr., and D. A. Gillette.
Water Air Soil Pollut, Vol 1, No 1, p 106-114, 1971, Illus.
Identifiers: *Aerosols, Atmosphere, Chemical composition, *Distribution, Frequency, Lognormal, Size.

A total of 329 size distributions, obtained from measurements of atmospheric aerosols collected at altitudes from the surface to 9 km, was tested for lognormally using the modified Kolmogoroff-Smirnov test. Samples were collected at Scottsbluff, Nebraska; Death Valley, California; and over the Pacific Ocean about 250 km west of Santa Barbara, California. When considered as volume density distributions, 98% of those tested were lognormal at the 5% level of significance with geometric means in the range of 0.4 to 4 micrometer. When the particle size range from 0.13 to 5.6 micrometer was divided into 48 size intervals, in which the number of particles in each interval was normalized to the total number, the number of particles with most class intervals above 1 micrometer was lognormally distributed at the 5% level. Below 1 micrometer lognormality appeared to be less likely at both high and low sampling altitudes. Concentrations of Cl, S, K, Ca, Si, and Ti measured for the same altitudes and at the same locations were in general lognormally distributed. Calculations which compared the coagulation rate of a size distribution of fixed functional form with that of a mean of size distributions formed by the coagulation of aerosols contained in small volumes, each having a particle distribution in which the number of particles in each size class was lognormally distributed about the mean, showed a probably insignificant difference. Based on the above results, it is speculated that the global aerosol may be described by 3 overlapping lognormal distributions.--Copyright 1972, Biological Abstracts, Inc.
W73-03722

GROUND-WATER CHARACTERISTICS IN A RECHARGE AREA, MAGDALENA MOUNTAINS, SOCORRO COUNTY, NEW MEXICO,
New Mexico Bureau of Mines and Mineral Resources.
For primary bibliographic entry see Field 04B.
W73-03730

PRESERVATION AND STORAGE OF WATER SAMPLES FOR TRACE ELEMENT DETERMINATIONS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.

W73-03733

ORIGIN OF MINERALIZED WATER IN PRECAMBRIAN ROCKS OF THE UPPER PARAIBA BASIN, PARAIBA, BRAZIL,
Geological Survey, Washington, D.C.
S. L. Schoff.
Available from GPO, Washington, DC 20402 - Price $0.60 (paper cover). Geological Survey Water-Supply Paper 1663-H, 1972. 38 p, 3 fig, 1 plate, 2 tab, 31 ref.

Descriptors: *Water quality, *Groundwater, *Chemical analysis, *Water chemistry, *South America, Geochemistry, Hydrogeology, Dissolved solids, Salinity, Geology.
Identifiers: *Brazil, *Paraiba (Brazil).

The upper Rio Paraiba basin, a region of more than 12,000 sq km in the central part of Paraiba (Estado da Paraiba), northeast Brazil, has groundwater that is generally poor in chemical quality. Only about 3 percent of the wells yield water having less than 500 mg/liter of dissolved solids, and only 11 percent yield water having less than 1,000. The minimum dissolved-solids concentration, in milligrams per liter, is 334; the maximum, about 25,000; and the average, 4,300. The figures are based on a study of 212 chemical analyses of water from 106 water-supply wells that were drilled by or for the Superintendencia do Desenvolvimento do Nordeste (SUDENE). This study is part of a general investigation initiated by SUDENE into the causes of, and possible remedies for, the high mineralization of the water. The region is one of the most arid in northeast Brazil. It is suggested that the groundwater contains some residual sea water, introduced during an Upper Cretaceous marine invasion of the land, and that this water has been diluted by meteoric water and largely flushed out of the rocks in a process that is still incomplete but is continuing. (Woodard-USGS)
W73-03741

HYDROLOGY OF THE WEST FORK DRAINAGE OF THE GALLATIN RIVER, SOUTHWESTERN MONTANA, PRIOR TO COMMERCIAL RECREATIONAL DEVELOPMENT,
Montana Bureau of Mines and Geology, Butte.
For primary bibliographic entry see Field 04B.
W73-03743

EFFECTS OF SHORT PERIODS OF ANAEROBIC AND NEAR-ANAEROBIC CONDITIONS ON WATER UPTAKE BY TOBACCO ROOTS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 05C.
W73-03761

EFFECT OF A PLASTIC BARRIER UNDER THE NITRATE BAND ON NITROGEN UPTAKE BY PLANTS,
Agricultural Research Service, Watkinsfille, Ga.
For primary bibliographic entry see Field 03F.
W73-03767

NITROGEN MOVEMENT COMPARISONS IN CROPPED VERSUS FALLOWED SOILS,
Georgia Agricultural Experiment Station, Athens.
For primary bibliographic entry see Field 02G.
W73-03771

SOME CHEMICAL PROPERTIES OF SOILS FROM AREAS OF BARLEY GRASS (HORDEUM MURINUM L.) INFESTATION,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 02G.
W73-03772

THE MEASUREMENT AND MECHANISM OF ION DIFFUSION IN SOILS V. DIFFUSION OF HYDROGEN ION IN SOILS,
Oxford Univ. (England). Soil Science Lab.
For primary bibliographic entry see Field 02G.
W73-03773

A BIOLOGICAL METHOD FOR EVALUATING SOIL NITROGEN AVAILABILITY AND FORECASTING NITROGEN FERTILIZER NEEDS OF WHEAT,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Agronomy.
For primary bibliographic entry see Field 03F.
W73-03774

SOIL TEMPERATURE AND SOURCE OF NITROGEN IN RELATION TO NITRIFICATION IN SODDED AND CULTIVATED SOILS,
Georgia Univ., Athens. Coll. of Agricultural Experiment Stations.
For primary bibliographic entry see Field 02G.
W73-03775

DISTRIBUTION OF P, K, CA, MG, B, CU, MN, AND ZN IN PEANUT LINES NEAR MATURITY,
Virginia Polytechnic Inst. and State Univ., Holland. Tidewater Research Station.
For primary bibliographic entry see Field 03F.
W73-03781

THE DISTRIBUTION OF NITRIFYING BACTERIA IN SOIL AGGREGATES,
Tohoku Univ., Sendai (Japan). Inst. for Agricultural Research.
For primary bibliographic entry see Field 05B.
W73-03796

RESPONSE OF COTTON TO BORON,
Mississippi Agricultural and Forestry Experiment Station, State College.
For primary bibliographic entry see Field 03F.
W73-03799

NITROGEN RELEASE FROM SULFUR--COATED UREA, AS AFFECTED BY COATING WEIGHT, PLACEMENT AND TEMPERATURE,
National Fertilizer Development Center, Muscle Shoals, Ala.
S. E. Allen, C. M. Hunt, and G. L. Terman.
Agronomy Journal, Vol 63, No 4, p 529-533, 1971. 1 tab, 6 fig, 5 ref.

Descriptors: *Nitrogen, Incubation, Temperature, *Application methods, *Ureas, Bermudagrass.
Identifiers: Nitrogen release, *Sulfur-coated urea.

Greenhouse and laboratory studies were conducted to measure the factors controlling release of N from sulfur-coated urea (SCU). Results of two greenhouse pot experiments with common bermudagrass (Cynodon dactylon) and a third with uncropped soil in controlled environment regimes showed that the rate of dissolution of SCU increased greatly with higher temperatures of cropping or incubation. Dissolution rates of SCU granules were decreased by heavier coating with S, by inclusion of 0.5 percent coal tar oil microbicide in the coating, and by surface application, as compared to mixing with the soil. Satisfactorily coated urea (SCU) or split applications of uncoated ammonium nitrate (AN) or urea or both resulted in more uniform distribution of forage production and N uptake than did a single application of urea of AN at time of seeding. Greater yields of forage were obtained from single applications of some SCU products than from urea or AN. Apparent volatilization losses of surface-applied urea were severe, particularly at higher growth or incubation temperatures. Losses of N were reduced, but not entirely elimated by S-coating. (See also W73-03759) (Skogerboe-Colorado State)
W73-03800

DRY MATTER PRODUCTION AND NUTRIENT UPTAKE IN IRRIGATED COTTON (GOSSYPIUM HIRSUTUM),
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 03F.
W73-03802

RESTITUTION TO THE SOIL OF MINERAL ELEMENTS BY LITTER FALL AND PRECIPITATION IN FOUR FOREST STANDS IN EASTERN FRANCE (IN FRENCH),
Centre National de Recherches Forestieres, Nancy (France). Station de Sylviculture et de Production.
For primary bibliographic entry see Field 02G.
W73-03853

2L. Estuaries

BIOLOGICAL AND CHEMICAL OBSERVATIONS IN MUMFORD AND PALMER COVES (GROTON, CONN.) SEPTEMBER 1970-SEPTEMBER 1971,
Connecticut Univ., Noank. Marine Research Inst.
For primary bibliographic entry see Field 06G.
W73-03262

OYSTER REEF SEDIMENTATION, BILOXI BAY AREA, MISSISSIPPI,
Mississippi State Univ., State College. Water Resources Research Inst.
C. M. Hoskin.
Available from the National Technical Information Service as PB-213 802, $3.00 in paper copy, $0.95 in microfiche. Complete Report, July 1972. 35 p, 11 fig, 4 tab, 35 ref. OWRR A-051-MISS (2).

Descriptors: Estuaries, Suspended Load, *Bottom Sediments, Particle size, Reefs, *Mississippi, Bays.
Identifiers: *Biloxi Bay (Miss).

Size-frequency distributions were generated for sediment from three oyster reefs (27 samples) and two non-reef environments (33 samples). Reef sediments contained 10 percent gravel (shells), probably more sand, and less silt and clay than non-reef sediments. Reef sediments had leptokurtic, and non-reef sediments had platykurtic, size distributions. Grainsize modes in a given reef match fairly well with grainsize modes for sediment recovered from living oyster shells and dead shells. Sand and silt modes, mean size, standard deviation and skewness did not discriminate reef and non-reef sediments. Sand modes ranged between 1.88 and 3.65 Ph: (0.272 to 0.080 mm). Some sand, and most silt fractions were polymodal. Common silt modes were 4.25 and 6.75 Ph: (0.053 and 0.0094 mm). Most sediments had a mean size in the silt range, were very poorly sorted and fine-skewed. Measured tidal currents ranged up to 0.94 ft/sec, and near-bottom currents met the threshold velocity of 0.5 ft/sec for erosion and transport. Suspended sediment load ranged between 58 and 183 mg/l. Suspended sediment load varied with location, tending to be greatest down-wind. Suspended sediment load decreased from an average of 113 to 81 mg/l over a 14-hour period of rising tide and calming wind.
W73-03264

GROUNDWATER RESERVOIR RESPONSE TO EARTH TIDES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Geological Science.
For primary bibliographic entry see Field 02F.
W73-03271

BIOLOGICAL AND CHEMICAL STUDY OF VIRGINIA'S ESTUARIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
M. L. Brehmer.
Available from the National Technical Service as PB-213 815, $3.00 in paper, $0.95 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 45, April 1972. 69 p, 31 fig, 6 tab, 11 ref. OWRR Project B-003-VA (1).

Descriptors: *Estuaries, *Nitrogen, *Phosphorus, *Phytoplankton, Hydrography, *Virginia, *Chlorophyll, *Sediments, Pollutant identification, Sampling, Water analysis.
Identifiers: *York estuary (Va), *James estuary (Va), *Rappahannock estuary (Va).

Stations were established at the 20, 15, 10, 5, and less than 0.5 o/oo isohalines as measured at the 3 m depth with a portable salinometer in the James, York, and Rappahannock estuaries. Cruises were conducted monthly over a 2 1/2 year period and water samples were collected from each station for physical, chemical, and biological analyses. Daily hydrographic cruises were scheduled after the passage of Hurricane Camille to enable description of the effects of a near-record flood on estuarine systems. Sediment samples were collected at five mile intervals from the mouth to the mean transition zone in each system. Total nitrogen levels in the water column seldom exceeded 200 micrograms-at/l in the winter and spring and 50 micrograms-at/l in the summer and fall. No significant differences were noted within stations between years in the York or Rappahannock but the James River showed greater variability. The chemical form of the nitrogen also varied. Total phosphorus levels in the estuaries were usually less than 4 micrograms-at/l with an average value of approximately 2 micrograms-at/l. Particulate phosphorus was frequently the dominant form in the oligohaline zone whereas, especially in the summer and fall, soluble phosphorus was the dominant form in the polyhaline zone. Sediment nutrient levels were approximately 1,000 higher than the nutrient levels in the water column. A direct correlation was observed between sediment nitrogen levels and percentage of organic matter in the sediment. This relationship did not hold for phosphorus. Chlorophyll 'a' levels in the water seldom exceeded 10 micrograms-at/l. Values were usually highest in the York-Pamunkey system and lowest in the Rappahannock.
W73-03273

DISTINCTION OF ELEMENTARY SAND POPULATIONS IN THE GIRONDE ESTUARY (FRANCE) BY R-MODE FACTOR ANALYSIS OF GRAIN-SIZE DATA,
Institut de Geologie du Bassin d'Aquitaine, Talence (France).
G. P. Allen, P. Castaing, and A. Klingebeil.
Sedimentology, Vol 19, No 1-2, p 21-35, September 1972. 7 fig, 26 ref.

Descriptors: *Sediment transport, *Particle size, *Statistical methods, *Sands, Statistics, Bed load, Suspended load, Saltation, Estuaries, Deposition (Sediments), Probability, Statistics.
Identifiers: *Factor analysis, *Gironde Estuary (France).

An R-mode factor analysis was made on the grain-size classes of the sediments in the Gironde estuary (France) in order to group the sieve sizes into dynamically significant factors. Three main groups of sand populations exist within the distributional province investigated. Comparison with previous works suggests that each group reflects a specific transport mechanism. The main group boundaries are the same as those observed on the log-probability cumulative size curves of the sediments. The three main groups consist of the following sizes: finer than 3.0 phi, 3.0-0.6 phi, and coarser than 0.6 phi. The three groups represent respectively pure (or uniform) suspension transport, mixed suspension bed-load, and pure bed-load (surface creep) transport. Furthermore, a subdivision exists in the mixed-suspension--bed-load group: the sediments between 3.0 phi and 2.0 phi represent a graded suspension transport while the sizes between 2.0 phi and 0.6 phi represent saltation (graded suspension plus bed-load). All the samples containing more than 5% of the surface creep population plot either as 'graded-suspension plus rolling' or as 'rolling' in the CM pattern of the sediments. (Knapp-USGS)
W73-03287

MARSHLAND TITLE DILEMMA: A TIDAL PHENOMENON,
For primary bibliographic entry see Field 06E.
W73-03326

TINICUM NATIONAL ENVIRONMENTAL CENTER.
For primary bibliographic entry see Field 06E.
W73-03343

TINICUM NATIONAL ENVIRONMENTAL CENTER--LEGISLATIVE HISTORY.
For primary bibliographic entry see Field 06E.
W73-03344

NUTRIENTS AND EUTROPHICATION IN THE PAMLICO RIVER ESTUARY, N.C. - PRELIMINARY RESULTS, 1971-72,
North Carolina State Univ., Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W73-03401

CONTROLLED DISCHARGE FROM THE W.P. FRANKLIN DAM AS A MEANS OF FLUSHING SALINE WATER FROM THE FRESH-WATER REACH OF THE CALOOSAHATCHEE RIVER, LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 05G.
W73-03405

MOVEMENT AND DISPERSION OF SOLUBLE POLLUTANTS IN THE NORTHEAST CAPE FEAR ESTUARY, NORTH CAROLINA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-03406

SEDIMENT TRANSPORT IN A MISSISSIPPI RIVER DISTRIBUTARY--BAYOU LAFOURCHE, LOUISIANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02J.
W73-03407

RELATIONS BETWEEN HORTON'S LAWS AND HYDRAULIC GEOMETRY AS APPLIED TO TIDAL NETWORKS,
Harvard Univ., Cambridge, Mass. Graduate School of Design; and Harvard Univ., Cambridge, Mass. Lab. for Computer Graphics and Spatial Analysis.
M. Woldenberg.
Available from NTIS, Springfield, Va. 22151 as AD-744 043, Price $3.00 printed copy; 95 cents microfiche. Harvard University Papers in Theoretical Geography, Paper No 45, June 10, 1972. 39 p, 4 fig, 7 tab, 31 ref, append. ONR Contract 0014-67A-0298-0004.

Descriptors: *River forecasting, *Channel morphology, *Dimensional analysis, *Hydraulic gradient, *Estuaries, Tidal streams, Hydrologic equation, Mathematical studies, Hydrologic systems, River basins, Tributaries, Streamflow forecasting, Remote sensing, Aerial photography, Data collections.
Identifiers: *Hydraulic geometry relations, *Geometric progressions, Stream networks, Tidal networks, Network morphometry.

Mathematical relations between power functions (e.g., hydraulic geometry relations) and geometric progressions (Horton's laws) for stream networks in general, and tidal networks in particular are explained. The exponent of the power function is the quotient of the logarithm of the Horton ratio of the dependent variable to the logarithm of the Horton ratio of the independent variable. It may be possible to predict exponents for the hydraulic geometry equations directly from air photographs of tidal streams. Much of the reasoning may also be applied to fresh-water streams, and organic branching systems such as the human lung. (Woodard-USGS)
W73-03416

SEASONAL COMPOSITION OF TERMPERATE PLANKTON COMMUNITIES: FREE AMINO ACIDS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05C.
W73-03441

SEASONAL COMPOSITION OF TEMPERATE PLANKTON COMMUNITIES: FATTY ACIDS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05C.
W73-03442

DOMINANCE-DIVERSITY RELATIONSHIPS OF THE FREE AMINO ACIDS IN COASTAL ZOOPLANTON,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05C.
W73-03443

THE STRUCTURE OF AN EXPERIMENTAL INFAUNAL COMMUNITY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05C.
W73-03445

A BIBLIOGRAPHY ON MARINE AND ESTUARINE OIL POLLUTION.
Marine Biological Association of the United Kingdom, Plymouth (England). Library.
For primary bibliographic entry see Field 05G.
W73-03451

A STATE OF THE ART SURVEY OF THE APPLICATIONS OF AERIAL REMOTE SENSING TO COASTAL ENGINEERING,
Clemson Univ., S.C. Dept. of Civil Engineering.
D. B. Stafford.
Research Report, May 1972. 186 p, 4 tab, 209 ref. USACE Contract DACW72-70-C-0034.

Descriptors: *Remote sensing, *Coastal engineering, *Hydrologic systems, *Bibliographies, *Abstracts, Instrumentation, Reviews, Data collections, Analytical techniques, Aerial photography, Aircraft, Satellites (Artificial), Beach erosion, Estuaries, Ecology, Water pollution sources, Currents (Water), Mapping, Photogrammetry.

A state of the art summary is presented of the applications of aerial remote sensing techniques in the field of coastal engineering. The goal is to integrate the available knowledge contained in the references listed in the annotated bibliography.

The summary evaluates the existing use of aerial remote sensors in coastal engineering studies and the potential applications of each sensor. Each aerial remote sensor is covered separately. Aerial photographs constitute the most common aerial remote sensor that has been used in coastal engineering applications. The more than 200 references contained in the compilation of pertinent literature have been annotated to provide a means for quickly evaluating the information content of the references. The annotations have been designed to give a concise but informative summary of the references listed in the bibliography. The type of data that was obtained from the aerial remote sensors is described, and a keyword vocabulary for aerial remote sensors and coastal applications is included. (Woodard-USGS)
W73-03523

STATE AND LOCAL WETLANDS REGULATION: THE PROBLEM OF TAKING WITHOUT JUST COMPENSATION.
For primary bibliographic entry see Field 06E.
W73-03580

THE CHESAPEAKE AND DELAWARE CANAL.
For primary bibliographic entry see Field 08A.
W73-03587

WATER SUPPLY FROM ESTUARIAL SOURCES,
Parsons Brinckerhoff-Hirota Associates, Honolulu, Hawaii; and New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 03A.
W73-03639

AN EFFICIENT QUANTITATIVE METHOD FOR SAMPLING THE MEIOBENTHOS,
North Carolina Univ., Chapel Hill. Dept. of Zoology.
For primary bibliographic entry see Field 07B.
W73-03674

THE DISTRIBUTION OF SPIDERS OF SPURN HEAD (E. YORKSHIRE) IN RELATION TO FLOODING,
Hull Univ. (England). Dept. of Zoology.
J. H. Sudd.
J Anim Ecol, Vol 41, No 1, p 63-70, 1972, Illus.
Identifiers: Distribution, England, *Floods, *Spiders, Vegetation, Yorkshire.

Forty-eight spp. of spiders were caught by pit-fall traps from 11 sites in dune-scrub and salt-marsh at Spurn Head, East Yorkshire over a period of 2 yr. The distributions of the catches of 20 common species were analyzed by rank correlation methods in relation to the frequency of flooding by salt-water and the height of vegetation at each site. This has discriminated 3 groups of species of high internal consistency of preference, and a residual group having a low correlation with flooding and vegetation and a low internal consistency.--Copyright 1972, Biological Abstracts, Inc.
W73-03719

TEMPERATURE FLUCTUATIONS AT A FIXED POSITION IN SAN DIEGO BAY,
Naval Undersea Research and Development Center, San Diego, Calif.
E. L. Smith.
Available from NTIS, Springfield, V a 22151 as AD-744 921 Price $3.00 printed copy; $0.95 microfiche. Report NUC TP 298, July 1972. 28 p, 9 fig, 2 tab, 24 ref.

Descriptors: *Water temperature, *Data collections, *Bays, *California, *Thermal properties, Measurement, Tidal effects, Thermocline, Seasonal, Diurnal, Vertical migration.
Identifiers: *San Diego Bay (Calif).

The thermal structure of San Diego Bay and the mechanisms that significantly influence it were investigated. There are oscillations in the thermal structure that are related to tidal forces with periods of 24.6, 12.3, 8.3, and 6.2 hr. A two-layer system develops in the spring and remains until autumn. The surface layer responds in phase to the surface tides, and the bottom layer follows the phase of the surface tide in time from 0.5 to 1.5 hr. Temperature inversions occur in the spring and autumn, at night, and only during the low-water phase of spring tides. The bay has an annual temperature cycle: The maximum temperatures occur in July and August and the minimum in January and February. The annual temperature change for surface and bottom water is 17.4 deg C. The vertical temperature gradient is maximum during the summer at about 0.5 deg C/m. (Woodard-USGS)
W73-03731

FORMS OF SEDIMENT ACCUMULATION IN THE BEACH ZONE,
Massachusetts Univ., Amherst. Coastal Research Center.
For primary bibliographic entry see Field 02J.
W73-03734

ANALOG MODEL STUDY OF GROUND--WATER FLOW IN THE REHOBOTH BAY AREA, DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies.
S. R. Stegner.
Available from NTIS, Springfield, Va 22151 AD-746 890 Price $3.00 printed copy; $0.95 microfiche. Technical Report No 12, July 1972. 67 p, 21 fig, 5 tab, 9 ref, append. ONR Contract No N00014-69-A0407.

Descriptors: *Groundwater resources, *Saline water intrusion, *Coasts, *Delaware, *Model studies, Water wells, Water supply, Water pollution sources, Salinity, Bays, Groundwater movement, Hydrogeology, Geology, Mathematical studies, Equations, Saline water-freshwater interfaces, Hydrology, Forecasting.
Identifiers: *Rehoboth Bay area (Del).

The Rehoboth Bay area, Delaware, depends on groundwater for its fresh-water supply, but increased pumping demands may threaten to lower the water table and allow salt-water intrusion into the wells. A Hele-Shaw (viscous flow) analog model was used in an analogy between flow through porous media and viscous flow in a narrow capillary space. The model makes it possible to use two different glycerin solutions, flowing in a 1 mm space in the laboratory, to make observations and predict interactions between fresh and salt groundwater in nature. Results include the amount of fresh water being discharged to the sea and the extent of salt-water intrusion under various imposed natural conditions. If Indian River Inlet were to be closed, whether by locks or by filling, and Rehoboth Bay were allowed to rise and seek its own level, the size of the fresh groundwater body would increase, and a more favorably positioned salt-water interface would be formed. This would increase significantly the amount of usable fresh water, and pumping would less likely produce salt-water pollution of the wells. (Woodard-USGS)
W73-03745

STUDIES ON THE REPRODUCTION OF CRASSOSTREA IN THE BAY OF CADIZ (IN SPANISH),
Instituto de Investigaciones Pesqueras, Cadiz (Spain).
E. Pascual.
Invest Pesq, Vol 35, No 2, p 639-646, 1971, Illus, English summary.
Identifiers: Cadiz Bay, Crassostrea, Crassostrea angulata, *Reproduction, *Oysters.

Sexual maturation and planktonic larvae of oysters, Crassostrea angulata (Lmk.) were studied in the Cadiz Bay, South-Atlantic coast of Spain. Spawning period extends from June to Nov. Larvae of advanced stages were not observed in summer. No clear relation was found between the number of larvae and environmental factors. Occurrence of larvae did not follow a definite pattern.--Copyright 1972, Biological Abstracts, Inc.
W73-03821

SHALLOW WATER WELLS IN COASTAL AREAS,
Civil Engineer Corps, Port Hueneme, Calif.
For primary bibliographic entry see Field 08A.
W73-03846

EFFECTS OF TEMPERATURE AND MOISTURE ON THE GERMINATION OF TWO ECOTYPES OF SONCHUS ARVENSIS L.,
Groningen Rijksuniversiteit, Haren (Netherlands). Afdeling Plantenoecologie.
For primary bibliographic entry see Field 02I.
W73-03864

OBSERVATION OF A PHENOMENON OF RED TIDE IN THE BAY OF VALPARAISO (IN SPANISH),
Chile Univ., Vina del Mar. Departamento de Oceanologia.
For primary bibliographic entry see Field 05C.
W73-03870

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SALINE WATER CONVERSION ACT OF 1971 (LEGISLATIVE HISTORY).
For primary bibliographic entry see Field 06E.
W73-03342

WATER PURIFICATION AND STORAGE APPARATUS,
For primary bibliographic entry see Field 05F.
W73-03368

DESALTING AND PURIFYING WATER BY CONTINUOUS ION EXCHANGE,
Gulf Degremont, Inc., Liberty Corner, N.J. (assignee).
C. H. Thorborg.
U.S. Patent No 3,607,739, 4 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1230, September 21, 1971.

Descriptors: *Patents, *Ion exchange, *Desalination, Water purification, Brackish water, Sea water, Potable water, Fresh water, Resins, *Anion exchange, *Cation exchange, Water treatment, *Industrial wastes, *Sewage treatment, Water quality.

As water moves continuously through the three units in series, an ion exchange resin flows countercurrent through it. A weak base anion exchange resin in the bicarbonate state passes through the first unit and the same resin, the free base form, passes through the third unit. Passing countercurrent to the effluent in the second unit is a weak acid cation exchange resin. After passage through the first and second units, the resins are regenerated. (Sinha-OEIS)
W73-03376

TREATING SEA WATER WITH PRODUCTION OF CHLORINE AND FERTILIZER,
S. Inoue, K. Hayashi, M. Tamura, and M. Kamiyoshi.
U.S. Patent No 3,607,688, 4 p, 4 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1219, September 21, 1971.

Descriptors: *Patents, Separation techniques, *Desalination, Saline water, Sea water, Potable water, Fresh water, Chlorine, Fertilizer, Water treatment, Water purification, *Electrolysis, Hydrogen ion concentration.
Identifiers: *Phosphoric acid.

Phosphoric acid is added to sea water and the mixture is poured into a cathode compartment having a low hydrogen overvoltage. The anion compartment is filled with a concentrated chlorine solution. The two compartments are separated by a porous membrane. The catholyte discharge will contain a citrate-soluble fertilizer but will be relatively free from scale forming ions. The adjustment of the pH value of catholyte when electrolyzing sea water by the use of the two-compartment electrolytic cell is achieved by the adjustment between an electric current and the rate of supply of sea water containing phosphoric acid into the electrolytic cell. (Sinha-OEIS)
W73-03378

SINGLE-STAGE FLASH DISTILLATION APPARATUS IN A STEAM CONDENSATION PLANT,
Electricite de France, Paris (assignee).
J. Mascarello, and R. Personnic.
U.S. Patent No 3,607,664, 3 p, 4 fig, 8 ref; Gazette of the United States Patent Office, Vol 890, No 4, p 1215, September 21, 1971.

Descriptors: *Patents, *Water purification, *Water treatment, *Distillation, *Flash distillation, Condensation, Separation techniques, Treatment, Potable water.
Identifiers: Vaporization.

The apparatus for the production of pure water by flash distillation comprises an instantaneous vaporization and condensation chamber in association with a condenser. By benefiting from the heating effect to which the water of the cooling circuit is subjected, there is formed a positive temperature difference between the impure water which is introduced into a condensation chamber and the condensation chamber itself and pure water is produced. (Sinha-OEIS)
W73-03379

REVERSE OSMOSIS TEST CELL,
Universal Water Corp., Del Mar, Calif. (assignee).
S. Manjikian.
U.S. Patent No 3,674,152, 3 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 900, No 1, p 147, July 4, 1972.

Descriptors: *Patents, *Reverse osmosis, *Water purification, *Water treatment, Equipment, Separation techniques, Water quality, Water quality control.

The reverse osmosis cell comprises a pressure resistant body containing a semipermeable membrane. There is an adjustable gap through which the feed water flows over the membrane surface. The gap is formed between the membrane surface and the surface of a disk having a stem screw-thread mounted inside the cell so that rotation of the stem will move the disk surface closer to or farther from the membrane surface. An O-ring seals the disk stem to the cell interior and provides friction to maintain the gap adjustment. (Sinha-OEIS)
W73-03389

METHOD OF WATER PURIFICATION,
Aluminum Co., of America, Pittsburgh, Pa. (assignee).
M. H. Brown.
U.S. Patent No 3,674,652, 5 p, 11 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 900, No 1, p 258, July 4, 1972.

Descriptors: *Patents, *Desalination, *Distillation, Saline water, Fresh water, Sea water, Potable water, Separation techniques, *Evaporation, *Condensation, Water vapor.

Saline water is evaporated at less than atmospheric pressure producing over a given time period, a gaseous mixture containing water vapor and a non-condensible gas. The mixture is subject to condensation to recover the water vapor. The remainder of the gas mixture is encapsulated in a foamed liquid. (Sinha-OEIS)
W73-03391

DESALINATION PROCESS,
Struthers Scientific and International Corp., New York (assignee).
N. Ganiaris.
U.S. Patent No 3,675,436, 3 p, 1 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 900, No 2, p 463, July 11, 1972.

Descriptors: *Patents, *Desalination, *Freezing, *Natural gas, Sea water, Saline water, Fresh water, Potable water, Water purification, Water quality, Water treatment, Heat exchanger.
Identifiers: Liquified natural gas.

Liquified natural gas is passed through a heat exchanger to receive heat from a refrigerant such as n-butane which is stored in a reservoir and circulated through the heat exchanger. This revaporizes the liquified natural gas for use. The freeze desalination of sea water is accomplished by using the refrigeration potential released during the regassification of liquified natural gas. Sea water feed is cooled in an ice melter to near freezing, is passed to a crystallizer where ice crystals are formed by direct contact with a refrigerant. Ice crystals are separated and fed into an ice melter and fresh water removed. (Sinha-OEIS)
W73-03393

THE ECONOMICS OF DESALTING BRACKISH WATERS FOR REGIONAL, MUNICIPAL AND INDUSTRIAL WATER SUPPLY IN WEST TEXAS,
Parsons (Ralph M.) Co., Los Angeles, Calif.
S. L. Scheffer, H. D. Holloway, and E. F. Miller.
Available from the National Technical Information Service as PB-206 321, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water, Research and Development Progress Report No. 337, Sept 1967. 300 p. OSW-14-01-0001-1459.

Descriptors: *Desalination, Feasibility studies, *Cost analysis, Engineering, Evaluation, Treatment, Water quality, *Reverse osmosis, *Electrodialysis, *Vapor compression distillation, Freezing, *Texas.
Identifiers: *Vacuum Freezing.

A preliminary engineering assessment is presented of the feasibility and cost of applying various desalting techniques to brackish ground waters in West Texas to produce potable water for municipal and industrial uses in regions of West Texas. The specific regions studied, by counties or groups of counties, were: El Paso, Reeves-Ward-Winkler, Ector-Midland, Crane-Reagan-Upton, Taylor, and Childress-Hardman-Vernon. Plant sizes ranged from 36 cents to 1.15 dollars per thousand gallons. For each region, data are provided on existing water supplies, future water requirements, economic and financial data, current and possible future water resources, alternative desalting possibilities and cost comparisons and brine disposal alternatives. (OSW abstract)
W73-03433

ELECTROCHEMICAL DEMINERALIZATION OF WATER WITH CARBON ELECTRODES,
Oklahoma Univ., Norman.
G. W. Murphy, D. Caudle Hock, A. Papastamataki, J. H. Tucker, and E. N. Wood.
Available from the National Technical Information Service as PB-207 364, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 140, July 1965. 98 p, 5 fig, 17 tab. 14-01-0001-361.

Descriptors: *Desalination, *Electrochemistory, *Anion Adsorption, *Cation adsorption, *Demineralization, *Electrodes.
Identifiers: Electrode-Dn Electodes, Ion Adsorpition, Cation Responsive Electrodes, Anion Responsive Electrodes, Anion Responsive Electrodes, Murphy Process.

New procedures have been developed for the preparation of electrodes possessing exceptional mechanical stability and, for different purposes, electrodes from slurries of carbon without added dispersants. The incorporation of 3% EPT in a toluene slurry of carbon imparts the desired stability to the finished electrodes without affecting the capacity. These preparations have the disadvantage of requiring an organic solvent as the dispersion medium; also, the finished electrodes prepared from them appear somewhat less porous than electrodes prepared from water dispersions. Any aliphatic polymer of high molecular weight could probably be used as electrode binder; however, on the basis of limited data, polymers containing aromatic segments would be less desirable for this purpose. Generally, electrodes prepared from slurries containing only water and carbon displayed relatively poor mechanical stability, with the exception of mixtures of various carbons with graphite. Although water slurries of carbons and carbon mixtures are unstable and must be mixed continuously during electrode fabrication, satisfactory electrodes can be prepared by using proper precautions. These electrodes allow determination of the demineralization behavior of carbons without the complicating presence of binders or dispersants. (OSW abstract)
W73-03434

CRYSTAL NUCLEATION FROM SOLUTION,
Case Inst. of Tech., Cleveland, Ohio.
A. G. Walton.
Available from the National Technical Information Service as PB-210 550, $4.75 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 263, 1967. 48 p, 4 tab, 10 fig. OSW Contract 14-01-0001-388.

Descriptors: *Crystallization, *Nucleation, *Theoretical analysis, *Crystal growth, Chemical precipitation, Interfaces, Solubility, Supersaturation, *Desalination.
Identifiers: Epitaxial growth, Interfacial chemistry, Statistical mechanics.

The existing theories and extensions thereto, seem to account semiquantitatively for both the general observations in analytical chemistry, geochemistry and applied precipitation systems, and the quantitative data explored here. It has been shown that for sparingly soluble salts, nucleation catalysis is favored by substrates which have high energy (adsorbtion) sites but which do not have a high surface diffusional energy barrier for adsorbed species arriving at such sites. The heterogeneous nucleation process has been shown, both in theory and practice, to be strongly termperature dependent, catalysis improving with increase in temperature. (The leads to the rather ironic situation that strongly supercooling a solution may not always be the best way of causing it to crystalize.) The lattice arrangement of deposit on the substrate is also of some importance, the better the lattice

match, the better the catalysis. Of particular importance are the solvation energy of the deposit (low solvation energy improves catalysis), and solubility (high solubility causes direct addition to the cluster and this eliminates the surface diffusion barrier). (OSW abstract)
W73-03435

A FLOW WORK EXCHANGER FOR DESALINATION PROCESSES,
Kansas State Univ., Manhattan.
Cheng Chen-Yen, and Fan Liang-Tseng.
Available from the National Technical Information Service as PB-207 664, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 357, August 1968. 70 p, 20 fig. OSW-14-01-0001-1166.

Descriptors: *Energy Transfer, *Desalination processes.
Identifiers: *Flow-Work Exchanger, Condensed Fluid Stream, Floating Piston Types, Bladder Types.

The purpose was the construction and hydraulic operation of flow-work exchangers in order to test the performance of each component part and to pinpoint problems which have to be taken into consideration in later designs. In the reverse osmosis process, the feed system must be pressurized to the operating pressure (400 to 1500 psi) and the reject brine has to be depressurized before being removed from the system. A flow-work exchanger is a unified piece of equipment which simultaneously pressurizes a condensed fluid stream and depressurizes a substantially equivalent volume of another condensed fluid stream. After a brief testing of a preliminary flow-work exchanger unit, two working units were constructed. The first unit, which has two floating-piston type displacement vessels, is operable under 1500 psig and delivers 9 gpm. The second unit, which has two bladder-type displacement vessels, is operable under 1500 psig and delivers 18 gpm. The initial study was limited to the construction and hydraulic operation of these units without coupling them to a reverse osmosis unit. The overall efficiencies of the units were as high as 90 to 95% at the rated capacities. (OSW abstract)
W73-03436

EFFECTS OF MANUFACTURING VARIABLES AND THE DEVELOPMENT OF REPLACEABLE MEMBRANE ELEMENTS FOR BRACKISH WATER TUBALAR REVERSE OSMOSIS SYSTEMS,
Envirogenics Co., El Monte, Calif.
R. Blevitt, R. H. Hartupee, and M. Marks.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $2.00. Office of Saline Water Research and Development Progress Report No 665, May 1971. 55 p, 19 fig, 12 tab, OSW Contract 14-30-2665.

Descriptors: *Desalination, *Reverse Osmosis, *Membranes, Membrane Processes, *Brackish water.

Emphasis was placed on the development of reliable and reproducible methods for fabricating reverse osmosis tubular membrane-support composite elements made of braided fiberglass and for casting high flux and reverse osmosis tubular brackish water membranes. In addition, development of replaceable tubular membrane elements and of equipment suitable for their production and easy insertion into the tubular supports was also undertaken. In regard to membrane performance, utilizing tubular membranes formulated from a blend of cellulose di - and triacetates heat treated at 93 deg C, initial product water flux and sodium chloride rejection ratios at 800 psi on 1% NaCl feed were determined to be 29.6 gfd and 90.9% respectively. With similar membranes annealed at 90 deg C, average initial flux and rejection ratio values of 35.1 gfd and 87.9% were attained. (OSW abstract)
W73-03437

DEVELOPMENT OF AN ULTRASONIC DETECTOR FOR CALCIUM SULFATE SCALE DEPOSITS,
Midwest Research Inst., Kansas City, Mo.
F. R. Rollins, Jr.
Report available for sale by Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $0.40. Office of Saline Water Research and Development Progress Report No 715, Sept 1971. 31 p, 18 fig. OSW Contract 14-30-2653.

Descriptors: *Desalination, *Distillation, *Calcium Sulfate, *Heat Transfer, *Scaling, Ultrasonics.
Identifiers: *Scale Detection, *Transducers, Ultrasonic Echo Patterns.

The purpose was to develop an ultrasonic method for the detection of calcium sulfate scale which may form on the inside surfaces of heat transfer tubes. This purpose has been achieved and an additional benefit--early detection of boiling (and cavitation)--has been realized. Scale deposits as thin as 0.001 in. can be detected with relatively compact electronic equipment and a small transducer. The latter device is attached directly to one of the heat tubes. Project activity included: (1) investigation of methods for applying transducers and obtaining reproducible ultrasonic echo patterns, (2) design and assembly of a brine circulation and scale deposition system, and (3) evaluation of relationships between ultrasonic results, scale conditions, and other factors such as temperature, flow rate, and concentration factor of the circulating brine. Details of these activities and the ultimate results are given. (OSW abstract)
W73-03438

SYMPOSIUM ON ENHANCED TUBES FOR DESALINATION PLANTS,
Office of Saline Water, Washington, D.C.

Report of Symposium on Enhanced Tubes for Desalination Plants Sponsored by the Office of Saline Water, held in Washington, D.C. on March 11-12, 1969. 365p.

Descriptors: *Desalination Apparatus, *Heat Transfer, *Metal Pipes, *Desalination Processes, *Thermodynamic Behavior, Capital Costs, Operating Costs, Tubes, Desalination Plants, Distillation Evaporators, Long-Tube Vertical Distillation, Flash Distillation, Equipment, Saline Water.
Identifiers: *Enhanced Surface Tubes, Corrugated Tubes.

Sixteen papers dealing with recent developments sin studies on the use of enhanced surface tubes in desalination plants were presented at this symposium by various corporations and research laboratories. Some of the major topics investigated were: heat transfer test results of doubly fluted and spirally corrugated tubes; heat flux enhancement by vortex shear-flow; methods for production of enhanced surface tubes; and costs involved in the production and use of these tubes. The studies indicate that improvements in heat transfer coefficients of up to 50% could be obtained by the use of corrugated tubes instead of regular tubes, and that the use of enhanced surface tubes would represent a savings in capital and operating costs in both Vertical Tube Evaporator (VTE) and Multistage Flash (MSF) desalination plants. (OSW abstract)
W73-03439

POTOMAC RIVER REVERSE OSMOSIS TEST,
General Dynamics Corp., San Diego, Calif.
General Atomic Div.
J. Shultz.
Available from the National Technical Information Service as PB-207 653, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress No 216, October 1966. 18 p, 2 append, 14-01-0001-761.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, Pilot plants, *Potomac River, Water treatment.
Identifiers: Spiral wound module.

In October 1965, General Atomic performed a field test of the Reverse Osmosis Test Unit POGO, operating with the Potomac River as a feed water source. The purposes were (1) to verify the expectation that the semipermeable membrane rejects bacteria, (2) to evaluate the performance of reverse osmosis membrane modules on the trace contaminants in a natural feed, and (3) to obtain information on the behavior of the mechanical equipment. The Potomac River test showed that the biological contamination, as well as dissolved solids in a natural feed, are effectively removed by reverse osmosis to produce high quality water. The water flux was 5-6 gfd at an operating pressure of 600 psi. During the first five days operation the product water flux dropped approximately 4.5 percent. During the remainder of the test the flux declined no more than an additional one percent. Approximately 1000 gpd of water were produced for 10 days by 216 square feet of semipermeable membrane contained in thirty-six spiral wound membrane modules occupying a pressure vessel volume of approximately 1 1/4 cubic feet. (OSW abstract)
W73-03440

DESALINATION OF AGRICULTURAL TILE DRAINAGE.
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05D.
W73-03501

DESALINATION APPARATUS,
Selas Corp. of America, Dresher, Pa. (assignee)
R. Blaha.
U. S. Patent No. 3,608,730, 3 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 890, No 5, p 1466, September 28, 1971.

Descriptors: *Patents, Equipment, *Desalination, *Reverse osmosis, *Membranes, Semipermeable membranes, Sea water, Saline water, Fresh water, Separation techniques.

An apparatus for treatment by reverse osmosis comprises an inlet manifold, an exhaust manifold, a tube connected to the manifolds, a rigid porous element in the shape of a hollow cylinder with one closed end, and a semipermeable membrane surrounding and supported by the porous element. The membrane and its support are concentrically located within the tube through which the saline water is forced under pressure. (Sinha-OEIS)
W73-03606

DESALINATION OF WATER BY HEAT EXCHANGE, MICROWAVE HEATING AND FLASH DISTILLATION,
E. M. Knapp, and S. J. Nesbitt.
U. S. Patent No. 3,607,667, 4 p, 3 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1216, September 21, 1971.

Descriptors: *Patents, *Desalination, *Heat exchange, *Microwaves, *Flash distillation, Freshwater, Sea water, Treatment, Potable water, Water treatment, Water quality, *Centrifugation, Separation techniques.

A method for single step total flash distillation of water consists of the following: (1) raising the enthalpy of the water to the verge of flashing by

counter current heat exchange with very hot fresh water; (2) raising its enthalpy further by generating heat in situ by the application of microwave energy; (3) providing the heat of vaporization by heat exchange with superheated steam; (4) causing flashing to occur in an area of relatively lower pressure having the effect of a slight vacuum; and (5) separating the particulate matter expelled from the solute system by the change of state through the use of centrifugal means. (Sinha-OEIS)
W73-03613

METHOD AND APPARATUS FOR SALINE WATER EVAPORATION,
P. S. Roller.
U. S. Patent No. 3,607,666, 5 p, 6 fig, 2 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1216, September 21, 1971.

Descriptors: *Patents, *Deaeration, *Distillation, *Desalination, Sea water, Brine, Saline water, Air, Carbonates, Bicarbonates, Alkaline water, *Evaporation, Heat exchange, Freshwater, Potable water, Separation techniques.

The process for converting saline water containing alkaline bicarbonates and carbonates to fresh water and brine comprises deaerating the saline water then indirectly preheating the deaerated saline water. Carbon dioxide and air are recovered. The preheated saline water is evaporated in the course of or subsequent to evolving the carbon dioxide to produce fresh water and brine. (Sinha-OEIS)
W73-03614

THIN FALLING FILM, WATER FLASHING DISTILLATION SYSTEM,
Aluminum Co., of America, Pittsburgh, Pa. (assignee).
M. H. Brown.
U. S. Patent No. 3,597,329, 4 p, 3 fig, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 889, No 1, p 249, August 3, 1971.

Descriptors: *Patents, *Flash distillation, Water treatment, Water purification, *Distillation, Treatment, Separation techniques, *Evaporators, *Evaporation, Brackish water, *Desalination.

Water enters a chamber that is maintained at a pressure below its saturation pressure. A portion of the water is flash evaporated and a portion is discharged at reduced temperature. Evaporation occurs when the water is distributed over parallel, closely spaced vertical surfaces. As the water falls as a film, vapor is formed in the spaces between the vertical spaces and is removed in a direction transverse to the falling film. (Sinha-OEIS)
W73-03622

COMBINED PLANT INSTALLATION FOR PRODUCING ELECTRICAL POWER AND FRESH WATER FROM BRINE,
Compagnie Electro-Mecanique, Paris (France). (assignee).
T. Michels.
U. S. Patent No. 3,597,328, 5 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 889, No 1, p 249, August 3, 1971.

Descriptors: *Patents, *Desalination, Power plants, Turbines, Brine, Salt water, Brackish water, Freshwater, *Electric powerplants, *Evaporation, *Distillation, *Vapor compression distillation, Equipment.

A turbine is used to convert heat energy into electrical energy. A portion of the heat energy is used to drive a vapor compressor for producing fresh water from salt water. Heat not used by the electrical generator unit is used in an evaporator-distiller unit which also produces fresh water from salt water. (Sinha-OEIS)
W73-03623

CONCENTRATED BRINE-INCOMING FEED VAPOR COMPRESSION DESALINATION SYSTEM,
AMF, Inc., Greenwich, Conn. (assignee).
W. R. Williamson.
U. S. Patent No. 3,607,668, 4 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1216, September 21, 1971.

Descriptors: *Patents, *Desalination, Sea water, Fresh water, Potable water, *Distillation, *Vapor compression distillation, Flash distillation, *Evaporation, Brine, Separation techniques.
Identifiers: *Multistage flash evaporation.

This system comprises the compression of distillate vapor from the flash evaporation of brine existing from the bottom or lowest end of a multistage cycle in which compressed vapor is employed to power a sea feed heater imparting heat to the feed water. One of the ten claims describes the steps of passing heated sea water serially through successively lower pressure stages of a multistage flash evaporator to produce a vapor fraction and a brine fraction. The vapor fraction is condensed to produce a distillate. (Sinha-OEIS)
W73-03628

FLUID PURIFICATION SYSTEM,
General Electric Co., Schenectady, N.Y. (assignee).
L. B. Vandenberg.
U. S. Patent No. 3,607,663, 4 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1215, September 21, 1971.

Descriptors: *Patents, *Desalination, Sea water, Brine, Salt water, Freshwater, Turbines, *Water purification, Water treatment, *Condensation.
Identifiers: *Vapor compressors.

This desalination system uses a cascade of modified venturi tubes to extract fresh water from saturated steam in the nozzle throat with pressure recovery in a diffuser section. Heat transfer is achieved by direct contact between fluids. Hydraulic regeneration to reduce pumping energy is obtained by feedwater flowing down the cascade providing energy to move brine and fresh water up the cascade. (Sinha-OEIS)
W73-03629

RESEARCH ON SALINE WATER CONVERSION BY FREEZING,
Massachusetts Inst. of Tech., Cambridge.
T. K. Sherwood, P. L. T. Brian, A. F. Sarofim, and K. A. Smith.
Available from the National Technical Information Service as PB-210 548, $5.75 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No. 242, March 1967. 67 p, 16 fig, 4 tab, 55 ref. 14-01-0001-546.

Descriptors: *Desalination, *Freezing, *Ice, *Reverse Osmosis, Boundary layers, Nucleation, Heat transfer, Mass transfer, Melting.
Identifiers: Concentration polarization, Spontaneous nucleation, Secondary nucleation, Isobutylene, Crystallizer, Wash column, Counterwasher.

Six topics of desalination research (one relating primarily to reverse osmosis rather than freezing) are discussed. (1) Salt Concentration at Phase Boundaries: Concentration Polarization and Membrane Transport in Reverse Osmosis. (2) Nucleation and Growth of Ice Crystals with Direct Isobutylene Refrigeration. (a) In batch crystallization of ice from NaCl solutions using dispersions of immiscible liquid hydrocarbon refrigerants, spontaneous nucleation and freezing occurred at -4 to -6C. Lower nucleation temperatures were noted with 5 percent than with 0.2 percent solutions, but the subcooling at the nucleation point was less for the 5 percent solution. (b) Nucleation and freezing occurred at widely different times when a 0.2 percent NaCl solution was cooled by relatively cold (-6.7C) refrigerant while holding the subcooling at about 0.7C. (c) Ice particles are more active nucleating agents than the foreign agents normally found in the solutions. Ice crystals caused nucleation at subcoolings of less than 1C. (d) The kinetics of the nucleation rate (after the initial shower or after seeding) is not established, but the data obtained can be expressed by the simple form log $N/No \pm K4T$ where N is the number of particles found at time T following the introduction or formation of No particles. (3) Heat and Mass Transfer to Particles in Suspension. The transport coefficients obtained were expressed in terms of the dimensionless Nusselt numbers, Nh for heat transfer, and Nm for mass transfer. Nm was found to be about three times Nh for ice spheres melting under similar conditions, and the Nm for pivalic acid spheres were about twice those for ice. (4) Ice Formation in a Continuous Crystallizer. (5) Washing of Brine from Ice Crystals. (6) The Melting of Ice Particles. (OSW abstract)
W73-03630

SOLIDIFICATION AND SEPARATION OF ICE FROM SALINE WATER,
Massachusetts Inst. of Tech., Cambridge.
C. M. Adams, Jr., and Pradeep Rohatgi.
Available from the National Technical Information Service as PB0210 534. $6.25 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No. 142, September 1965. 14-01-0001-279.

Descriptors: *Desalination, *Freezing, *Ice, *Saline water, *Aqueous solutions, *Chlorides, Separation techniques.
Identifiers: Potassium chloride, Sodium chloride, Lithium chloride, Dendrite, Dendrite spacings, Mass transport, Heat transport, Magnetic fields, Electric fields.

A fundamental study was made of the separation of ice from saline solutions. The freezing was usually accomplished by contacting the specimen solution with a solid chill. The following conclusions were drawn: (1) Binary and ternary aqueous solutions, over a wide range of concentrations, upon relatively fast freezing, produce groups of parallel plateshaped dendrites of pure ice with salt entrapped between them. Within each group the plates have a common crystallographic orientation. (2) In unidirectional growth from a constant temperature chill, the solution at each level is subjected to a spectrum of freezing rates, starting low, passing through a maximum, and then decreasing. At each level the final dendrite spacing is inversely proportional to the square root of the maximum freezing rate. (3) Under progressive solidification, the dendrite spacing adjusts itself by the convergence or divergence of platelets, according to changing growth conditions. (4) An increase in solute concentration causes an increase in dendrite spacing, and, at relatively high concentration, side-branching of primary dendrites takes place. The increase in spacing is due to the increase in the capacity of the higher concentration liquid to sustain interdendritic supercooling. (5) Under similar freezing conditions, the dendrite spacing is wider, the higher the solute diffusivity. (6) When more than one solute is present, the resultant dendrite spacing is governed by the concentration and the diffusivity of each of the solutes. (7) Externally applied static and oscillating magnetic fields cause an increase in the dendrite spacing, but only in freezing systems in which the entire liquid is supercooled before the initiation of growth. (8) Electric fields have a slight effect on dendrite orientation, but none on dendrite spacing. (OSW abstract)
W73-03631

STUDIES ON ICE CRYSTAL GROWTH RATES AND HYDRATE REACTION KINETICS,
Syracuse Univ. Research Inst., N.Y.

R. Fernandez, J. B. Pangborn, S. L. Colten, and A. J. Barduhn.
Available from the National Technical Information Service as PB-210 546. $4.50 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Program Report No. 230, January 1967. 43 p, 14 fig, 4 tab, 7 ref, 1 append. 14-01-0001-617.

Descriptors: *Desalination, *Freezing, *Ice, *Hydrate Processes, Heat transfer, Nucleation.
Identifiers: *Methyl bromide, Sodium chloride solutions.

Experimental work has been completed on the growth of ice crystals in undercooled flowing distilled water. The growth rate of ice platelets growing along the basal plane has been studied as a function of applied undercooling for the range 0.020 to 0.600 C, and of the water velocity for the range 1.30 to 46.0 cms/sec. The data presented are correlated by a physical model which assumes that the growth rate is controlled by the convective transfer of heat from the tip region of the ice platelet to the flowing water. For water velocities 8.0 cms/sec. and higher, and within the range studied, the ice growth rate is proportional to the 3/2 power of the applied undercooling and to the 1/2 power of the water velocity. A tentative value of the ice-water interfacial energy is 31.8 plus or minus 1.8 ergs/cm2. The model does not correlate the data as well for water velocities less than 8.0 cms/sec. as it does for higher velocities, and probable reasons are advanced for the discrepancy. Though the maximum water velocity was more than doubled compared to previously attained values, heat transfer still controls the growth rate of ice platelets along their basal plane. The growth rate did not show a maximum with increasing water velocity. Experimentation on the kinetics of gas hydrate formation is incomplete. The dispersion of liquid agent into droplets seems to be the rate controlling factor at very low degrees of agitation while dissolution and diffusion of the agent from droplets is important in the next agitation increment. In general, a thick slurry appears to retard dissolution and diffusion of liquid agent, but this effect can be eliminated by power inputs in excess of 2.5 x 10-2 Hp per gallon. (OSW abstract)
W73-03632

WATER SUPPLY FROM ESTUARIAL SOURCES,
Parsons Brinckerhoff-Hirota Associates, Honolulu, Hawaii; and New York State Dept. of Environmental Conservation, Albany.
F. W. Montanari, and L. M. Brennan.
Presented at the American Water Works Association Annual Meeting, Denver, Colorado, June 1971. 13 p, 6 fig, 2 tab.

Descriptors: *Water sources, *Estuaries, *Desalination, *Electrodialysis, *Water supply, New York, Water demand, Water supply, Research and development, Feasibility studies, Cost analysis.

The need for water supply services in the Northeastern part of our nation has resulted in the development of most of the suitable reservoir sites close to the demand centers. Additional reservoir development could require extensive aqueduct works if the water is to be carried in conduits to points of use. There is no doubt that additional water supplies, in the traditional sense, are becoming very expensive and the problem becomes more critical when compounded by a rapidly growing population. An alternative solution to preclude future shortages is of course the development of new sources, such as desalting. The consulting firm of Stone and Webster, developed a computer program to investigate costs of a combined electrodialysis and pumping plant unit using as a water source a tidal estuary. Several different plant sites were chosen and different configurations for the electrodialysis unit were analyzed as well as different systems to bypass water. Equipment components and power costs were based on available figures; future technical improvements were not costed. Treatment costs ranged from 32 cents per 1,000 gallons to 66 cents per 1,000 gallons for a 1 mgd average plant output, while plant costs ranged from 50 million up to 372 million. (Poertner)
W73-03639

3B. Water Yield Improvement

GEOTHERMAL OVERVIEWS OF THE WESTERN UNITED STATES, 1972.
Geothermal Resources Council, Davis, Calif.

Available from Geothermal Resources Council, P. O. Box 1033, Davis, California 95616, Price $6.00. Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Publication, 1972.

Descriptors: *Geothermal studies, *Conferences, *Subsurface waters, *Thermal power, *Documentation, Thermal water, Water temperature, Thermal properties, Geology, Hydrogeology, Thermal springs, Faults (Geologic), Volcanoes, Exploration, Legislation, Drilling, Water quality, Geological surveys, Reviews.
Identifiers: *Geothermal resources, *Thermal energy.

Thirteen papers were presented at the First National Meeting of the Geothermal Resources Council held in El Centro, California, in February, 1972. The presentations include geothermal data from those western states with geothermal potential. Each paper was contributed by an individual (s) who is directly concerned with the regulation or development of his State's geothermal resources. With the exception of the paper on the Imperial Valley Project, each paper is concerned with an individual State: Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. For a geothermal reservoir to have appreciable potential for exploitation, it must meet the following requirements: (1) relatively high temperature (greater than 150 to 400 deg F, depending on processing technology); (2) a depth shallow enough to permit drilling (currently 10,000 ft or less); (3) sufficient rock permeability to allow the heat transfer agent (water and (or) steam) to flow continuously at a high rate; and (4) sufficient water recharge to maintain production over many years. (See W73-03420 thru W73-03432) (Woodard-USGS)
W73-03419

OVERVIEW OF GEOTHERMAL RESOURCES POTENTIAL IN ARIZONA,
Arizona Univ., Tucson.
J. W. Harshbarger.
In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Publication, Paper A, 1972. 13 p, 2 fig, 1 tab, 40 ref.

Descriptors: *Geothermal studies, Conferences, *Thermal water, *Subsurface waters, *Arizona, Geology, Geophysics, Water temperature, Thermal properties, Thermal springs, Thermal power, Data collections, Reviews.
Identifiers: *Geothermal resources.

There are data indicating a possibility that latent geothermal energy may be present at depth at several areas in southern Arizona. A listing is presented of localities where thermal waters of 100 F or greater are known. The locations of these occurrences are relatively close to population centers which could possibly utilize thermal energy. There are no known geothermal resources areas which produce geothermal steam in Arizona and no known boreholes have been drilled to explore the potential of geothermal energy. (See also W73-03419) (Woodard-USGS)
W73-03420

GEOTHERMAL RESOURCES IN CALIFORNIA,
California State Div. of Oil and Gas, Sacramento.
D. N. Anderson, and L. H. Axtell.
In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis California, Geothermal Resources Council Publication, Paper B, 1972. 33 p, 11 fig, 101 ref.

Descriptors: *Geothermal studies, Conferences, *Subsurface waters, *Thermal water, *California, Geysers, Thermal springs, Borehole geophysics, Geology, Water temperature, Thermal properties, Data collections, Thermal power, Thermal powerplants, Projections, Reviews.
Identifiers: *Thermal energy, *Geothermal resources.

The State of California is naturally endowed with notable areas of potentially productive geothermal land. The Geysers Geothermal field in Sonoma and Lake Counties has been under development for the last 15 years. The power facilities at The Geysers field are now capable of producing 192 megawatts, and construction and development drilling are under way to increase the capacity to above 600 mw by the end of 1975. Total potential power capacity at The Geysers is calculated to be in excess of 1,000 mw and may be as high as 4,800 mw. Geothermal power potential in Imperial Valley is estimated at 30,000 mw. The total 1970 California electric power-generating capacity, including imports, was approximately 32,000 mw. The power demand is expected to double to 60,000 mw by 1980. A new power-generating concept utilizing relatively low temperature geothermal waters in a closed system, rather than requiring steam, is in the development stage. This system, if developed, will be adaptable to several areas in the state that would not otherwise be considered to have economic geothermal potential. Development of geothermal resources in California is encouraged by existing state law and by recently enacted federal legislation. (See also W73-03419) (Woodard-USGS)
W73-03421

GEOTHERMAL EXPLORATION IN REGION 3 (IMPERIAL VALLEY PROJECT).
Bureau of Reclamation, Boulder City, Nev. Region 3.

In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Publication, Paper C, 1972. 9 p, 1 plate.

Descriptors: *Geothermal studies, Conferences, *Thermal water, *Subsurface waters, *California, Water resources development, Thermal power, Borehole geophysics, Geology, Water temperature, Thermal properties, Exploration, Data collections, Injection wells, Sea water, Land subsidence, Faults (Geologic), Reviews.
Identifiers: *Imperial Valley (Calif.), *Geothermal resources.

Geothermal exploration by the Bureau of Reclamation in the Imperial Valley, California, is described. The East Mesa and West Mesa areas of the Imperial Valley contain the geological prerequisites for a geothermal province. It lies astride one of the major spreading centers of the world, the East Pacific Rise, along which there are abnormal amounts of heat flow amounting to as much as 40 heat flow units in local areas. The heat flow is entering a tremendous prism of saturated

sediments, probably controlled by faulting associated with the mechanics of spreading along the East Pacific Rise. Thus, all the ingredients are present for a major project involving (1) utilization of the energy contained in the hot water, (2) reclamation of water by desalting processes, and (3) availability of sea water for injection to preclude subsidence and maintain pressures in the producing reservoirs. In addition, there are large areas of the valley which are not under cultivation or which are not being utilized as industrial or home sites. (See also W73-03419) (Woodard-USGS)
W73-03422

GEOTHERMAL RESOURCES OF COLORADO--A SUMMARY,
Geological Survey, Denver, Colo.
R. H. Pearl.
In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Publication, Paper D, 1972. 7 p, 1 tab, 13 ref.

Descriptors: *Geothermal studies, Conferences, *Subsurface waters, *Thermal power, *Colorado, Thermal water, Water temperature, Thermal properties, Geology, Hydrogeology, Evaluation, Reviews.
Identifiers: *Thermal energy, *Geothermal resources.

Geothermal resources of Colorado have not yet been developed. However, from evaluation of geologic conditions it appears that potential geothermal resources exist in several areas of the State. The surface manifestation of the geologic conditions in these areas includes hot springs, anomalous heat flow values and areas of Cenozoic volcanism. In December 1971, the State Board of Land Commissioners issued the first state lease for geothermal exploration. This lease, which totals nearly 7,000 acres, surrounds the Mount Princeton Hot Springs in Chaffee County. Numerous investigators have studied various facets of the geothermal resources of Colorado, primarily heat flow, and have reported their findings in journals. The references are listed. (See also W73-03419) (Woodard-USGS)
W73-03423

HAWAII OVERVIEW,
Hawaii Univ., Honolulu. Center for Engineering Research.
H. Harrenstien.
In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Publication, Paper E, 1972. 21 p, 10 fig, 1 tab, 7 ref.

Descriptors: *Geothermal studies, Conferences, *Subsurface waters, *Thermal power, *Hawaii, Volcanoes, Thermal water, Water temperature, Thermal properties, Geology, Hydrogeology, Exploration, Geophysics, Reviews.
Identifiers: *Geothermal resources, *Thermal energy.

Hawaiian geothermal energy resources appear, on first examination, to exist in forms which are somewhat different in geological formation and structure than those found in presently developed geothermal power locations around the world. Because of current active vulcanism, the potential in Hawaii may be vastly greater than these other locations. The Hawaiian Archipelago, which was entirely formed by volcanic action, is a group of islands, reefs, and shoals, stretching 1,600 miles. Warm water in wells has been found on the Puna rift, Kapoho, South Kohala; West Molokai; Waimanalo (Oahu); and West Maui. The maximum temperature of these water wells was about 95 deg F. Some of the best locations may be offshore along extensions of recently active rift zones at depths where the hydrostatic pressure of the sea would prevent flashing of hot water to steam. It is a gross anomoly that Hawaii, which has so much natural energy available to it, must depend almost exclusively on the burning of fossil fuels for its electrical energy supply. The time seems right for a geothermal resources exploration and development in Hawaii. (See also W73-03419) (Woodard-USGS)
W73-03424

GEOTHERMAL RESOURCES OF IDAHO,
Boise State Coll., Idaho.
M. M. Warner.
In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Publication, Paper F, 1972. 5 p, 2 fig.

Descriptors: *Geothermal studies, Conferences, *Subsurface waters, *Thermal power, *Idaho, Thermal water, Water temperature, Thermal properties, Geology, Hydrogeology, Geophysics, Exploration, Reviews.
Identifiers: *Geothermal resources, *Thermal energy.

The U. S. Geological Survey has outlined two Known Geothermal Resource Areas (KGRA's) in Idaho. One of these is on the State's eastern border next to Yellowstone Park and the other is near the south-central border along the Raft River. The total area is about 22,000 acres. Another reconnaissance has outlined 5 areas in addition to the two KGRA's of the USGS, which show indications of probable geothermal potential. If this postulated potential proves to be valid, the acreage of known potential in Idaho will be increased to about 400,000 acres. Surface conditions in the 7 favorable areas indicate that most of the areas are of the hot water type system rather than the vapor dominated type. Much of the southern part of the State where most of the favorable areas are, is underlain with hundreds to thousands of feet of permeable sediments. Therefore, more than one geothermal aquifer may exist beneath these areas. (See also W73-03419) (Woodard-USGS)
W73-03425

GEOTHERMAL EXPLORATION AND DEVELOPMENT IN NEVADA,
Nevada Bureau of Mines and Geology, Reno.
L. J. Garside, and J. H. Schilling.
In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Publication, Paper H, 1972. 7 p, 2 fig, 2 tab, 11 ref.

Descriptors: *Geothermal studies, Conferences, *Subsurface waters, *Thermal power, *Nevada, Thermal water, Thermal springs, Water temperature, Geology, Hydrogeology, Thermal properties, Geophysics, Exploration, Drilling, Reviews.
Identifiers: *Geothermal resources, *Thermal energy.

Nevada's geothermal resources appear to have great potential, although only a few of the many areas with prospective value have been examined in any detail. Only in the last decade have serious attempts been made to exploit Nevada's geothermal resources as a source of power. Drilling began in 1959 and continued through 1965. Nevada ranks second to California in exploration. Twelve geothermal areas in Nevada were tested by drilling during the 6 years of exploration activity. At 3 of these (Beowawe, Brady's, and Steamboat) wells were encountered with water temperatures greater than 350 F and appreciable volumes of water with 5% to 10% steam flashover. The deepest well drilled (at The Needles) is 5,888 feet deep. No drilling has been done since 1965, when problems of leasing on Federal land, as well as other problems, combined to completely stifle activity. As Federal regulations become clearer, it is anticipated that exploration will increase greatly. (See also W73-03419) (Woodard-USGS)
W73-03427

GEOTHERMAL PROSPECTS IN NEW MEXICO,
New Mexico Bureau of Mines and Mineral Resources.
W. K. Summers.
In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Publication, Paper I, 1972. 23 p, 3 fig, 2 tab, 13 ref.

Descriptors: *Geothermal studies, Conferences, *Subsurface waters, *Thermal power, *New Mexico, Thermal water, Water temperature, Thermal properties, Geology, Hydrogeology, Exploration, Drilling, Water quality, Reviews.
Identifiers: *Geothermal resources, *Thermal energy.

Sixty areas in New Mexico discharge groundwater at temperatures of 90 deg F or higher. The data for 47 areas have been field checked and show that (1) thermal waters occur in the western half of the State, primarily in the Rio Grande and Gila-San Francisco drainage basins; (2) 16 areas have been discovered by wells, whereas 31 areas are marked by springs; (3) the waters issue from rocks ranging from Precambrian to Cenozoic in age, with the Cenozoic rocks predominant; (4) the waters are associated with igneous and sedimentary rocks in about equal proportions; (5) the waters occur primarily in areas of extensive volcanism and secondarily in fault zones; (6) the waters discharge from springs near streams but mostly at points well above the river levels; (7) the discharge may be directly from fractures, from beneath a talus cover, or from alluvium, or from some combinations of these (one spring discharges from a tufa mound); and (8) the median pH is 7.7, the median maximum temperature is about 105 deg F, the median discharge of springs is 30.5 gpm, and the median concentration of sodium is 167 ppm, of magnesium 6.9 ppm, of calcium 37.6 ppm, of lithium 0.30 ppm, and of potassium 10.0 ppm. (See also W73-03419) (Woodard-USGS)
W73-03428

GEOTHERMAL OVERVIEW OF OREGON,
Oregon State Dept. of Geology and Mineral Industries, Portland.
R. G. Bowen.
In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Publication, Paper J, 1972. 9 p, 1 fig.

Descriptors: *Geothermal studies, Conferences, *Subsurface waters, *Thermal power, *Oregon, Thermal water, Water temperature, Thermal properties, Geology, Hydrogeology, Exploration, Projections, Reviews.
Identifiers: *Geothermal resources, *Thermal energy.

Although no electrical power is produced in Oregon from geothermal sources, the State has made more use of natural hot waters for space heating than any other state. Within the Klamath Falls area at least 500 homes, 8 schools, and several businesses make use of natural hot water for space heating. Hot water has been utilized for heating in other parts of the State: Lakeview, Burns, Vale, and many individual farms and homes scattered through the eastern two-thirds of

the State. Oregon has more recent volcanic activity than any other state. The Cascade Range that girds Oregon from north to south has flows dated as young as 1,400 years, and within the last 5 to 25 thousand years has been the subject of much spectacular volcanism. In the process of selection as required by the Federal Geothermal Act, the U.S. Geological Survey has classified over 15 million acres of land in Oregon as having prospective value, and seven areas have been designated as KGRA's (known geothermal resources areas). Three of these areas are within the Cascade Mountains. Numerous springs occur along both sides of the Clackamas River with a visible discharge of 200 to 300 gpm at temperatures up to 91 deg C. (See also W73-03419) (Woodard-USGS)
W73-03429

UTAH'S GEOTHERMAL RESOURCES, LOCATION, POTENTIAL, AND ADMINISTRATIVE AGENCIES,
Utah Geological and Mineralogical Survey, Salt Lake City.
W. P. Hewitt, C. H. Stowe, and R. R. Stromberg.
In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Publication, Paper K, 1972. 12 p, 5 fig, 6 ref.

Descriptors: *Geothermal studies, Conferences, *Subsurface waters, *Thermal power, *Utah, Thermal water, Water temperature, Thermal properties, Geology, Hydrogeology, Thermal springs, Exploration, Water quality, Reviews.
Identifiers: *Geothermal resources, *Thermal energy.

Two 'known geothermal resource areas' (KGRA) have been designated in southwest Utah: Crater Springs in south-central Juab County, and Roosevelt in northeast Beaver County. The two areas total 13,521 acres and are dissimilar. Crater Springs KGRA is based on Abraham (or Crater) Hot Springs which issue from a tufa mound about 15 feet high and several hundred feet in diameter on the floor of the Sevier Desert along the east side of a Quaternary basalt flow. Data show water temperatures as high as 189 deg F; flows of 250 to 5,000 gpm; and water of the sodium chloride type. Roosevelt KGRA is based on Roosevelt (or McKeans) Hot Springs which, dry in 1966, issued from a fault zone along the west side of the Mineral Mountains. Reported discharges during the 20th century changed from 10 gpm in 1908 with temperatures of 190 deg F, 101 ppm SiO2 and dissolved solids content of 645 ppm, to 1 gpm in 1950 with temperatures of 185 deg F, 405 ppm SiO2, and dissolved solids content of 7,040 ppm. In addition to the two KGRA's the USGS has outlined 31 geothermal resources provinces (GRP), areas that are considered prospects for geothermal resources. (See also W73-03419) (Woodard-USGS)
W73-03430.

GEOTHERMAL ENERGYIN WASHINGTON,
Wshington Dept. of Natural Resources, Olympia. Div. of Mines and Geology.
V. E. Livingston, Jr.
In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Pulbication, Paper L, 1972. 17 p, 2 tab, 40 ref.

Descriptors: *Geothermal studies, Conferences, *Subsurface waters, *Thermal power, *Washington, Thermal water, Water temperature, Geology, Hydrogeology, Thermal properties, Thermal springs, Faults (Geologic), Water quality, Exploration, Reviews.
Identifiers: *Geothermal resources, *Thermal energy.

Bonneville Power Administration reports that about 60 billion kilowatt hours of power were used in Washington during 1970. The B.P.A. estimates that the demand for power in 1980 will be about 103 billion kilowatt hours, and by 1990, 168 billion kilowatt hours. To meet the projected demand for power, new sources of energy must be found in Washington. One of those potential sources is geothermal energy. Washington has many areas that have a potential for the occurrence of geothermal energy. Clues for its occurrence may be found in the five large Pleistocene to Recent volcanoes located in the Cascade Mountains, in the mineral and hot springs that occur in the Olympic and Cascade Mountains, in the several large fault systems that occur in the southern Cascades, and around the northern and southern flanks of the Olympic Mountains. There are at least 35 known mineral and warm springs in Washington. Gamma Hot Springs, which contains the highest recorded water temperature (about 140 deg F), is at an elevation of about 5,000 feet on the northeast flank of Glacier Peak. Several large transverse faults occur in the southern part of the State in the vicinity of White Salmon and The Dalles, Oregon. These faults may be the conduits along which thermal waters have migrated upward to form mineral springs. These fault zones are as much as 2,000 feet wide and could be significant in the quest for geothermal energy. (See also W73-03419) (Woodard-USGS)
W73-03431

GEOTHERMAL RESOURCES, PRESENT AND FUTURE DEMAND FOR POWER, AND LEGISLATION IN THE STATE OF WYOMING,
Wyoming Univ., Laramie. Dept. of Geology.
E. R. Decker.
In: Geothermal Overviews of the Western United States, 1972, Proceedings of Geothermal Resources Council El Centro Conference, Feb 16-18, 1972: Davis, California, Geothermal Resources Council Publication, Paper M, 1972. 23 p, 2 fig, 1 tab, 63 ref.

Descriptors: *Geothermal studies, Conferences, *Subsurface waters, *Thermal power, *Wyoming, Thermal water, Water temperature, Geology, Hydrogeology, Thermal properties, Thermal springs, Water quality, Exploration, Legislation, Reviews.
Identifiers: *Geothermal resources, *Thermal energy.

Data are summarized on thermal springs and wells in the state of Wyoming, exclusive of Yellowstone Park. A map shows the general location of the springs and wells and the lands that have been classified as being prospectively of geothermal value. The locations, geothermal data, and chemical analyses of spring waters are tabulated. Present and future demands for electrical energy in Wyoming are summarized and legislation pertaining to exploration near thermal springs is reviewed. A bibliography contains 63 references on thermal springs (including geology) in Wyoming, excluding Yellowstone Park. (See also W73-03419) (Woodard-USGS)
W73-03432

DEVELOPMENT OF MANAGEMENT GUIDELINES FOR INCREASING SNOWPACK WATER YIELDS FROM PONDEROSA PINE FORESTS IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
D. B. Thorud, and P. F. Ffolliott.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-20, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 171-174, 1972. 19 ref.OWRR A-029-ARIZ (4). 14-31-0001-3503.

Descriptors: *Snowmelt, *Runoff, *Forest management, *Ponderosa pine trees, *Arizona, *Snowpacks, *Water yield improvement.
Identifiers: *Salt-Verde River Basin (Ariz).

Snowmelt on the Salt-Verde River Basin in Arizona yields a major portion (possible 50 percent or more) of the annual surface runoff that supplies six reservoirs. These reservoirs provide municipal, industrial, and agricultural water for the Phoenix metropolitan and nearby areas. About 30 percent of the Basin (2 1/2 million acres) is within the ponderosa pine forest zone, where much of the snowmelt runoff originates. Therefore, initial work in the development of forest management guidelines for increasing snowpack water yields is concentrated in this zone. These guidelines, to be effective, must be developed in a context that considers the constraints imposed by management objectives involving the other products and uses (e.g., timber, forage, wildlife, recreation opportunities) of the land. (See also W73-03536)
W73-03544

A DESIGN FOR CONSERVING WATER AT FLOODWATER-RETARDING STRUCTURES
Agricultural Research Service, Chickasha, Okla. Southern Great-Plains Watershed Research Center.
R. R. Schoof, J. W. Naney, and W. M. Boxley.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 220-224, 1972. 2 fig, 2 tab, 11 ref.

Descriptors: *Water consumption, *Water conservation, *Water yield, *Reservoirs, Runoff, Watersheds (Basins), Evapotranspiration, *Oklahoma, Seepage.
Identifiers: *Floodwater-retarding structures, Sugar Creek (Okla).

In areas where evaporation exceeds precipitation there is a loss of runoff at impoundments. From 1964 through 1970 inclusive, the water yield at a floodwater-retarding structure on Sugar Creek in southwestern Oklahoma was reduced 53 percent. The average annual consumption from the pool surface was about 61 inches. The annual precipitation averaging 25.4 inches added water to the impoundment. However, in 3 of the 7 years, preceipitation and runoff were offset by evapotranspiration so that the water level stayed below the principal spillway. Seepage under and around the dam was about 12 acre-feet per year greater than seepage into the impoundment. Since completion of the structure in 1964, groundwater storage downstream from the dam has increased about 80 acre-feet and is continuing to increase. A modified design for a floodwater-retarding structure has been suggested for locations where little permanent storage is required. The design features a deep pool with small surface area downstream from the dam and a detention pool which is dry except during periods of flow regulation. This modified design should alleviate the problems, including water yield reduction and salt accumulation through seepage and evapotranspiration, and erosion of the dams by wave action. (See also W73-03536) (ARS abstract)
W73-03546

EFFECT OF AN ASPEN CLEARCUTTING ON WATER YIELD AND QUALITY IN NORTHERN MINNESOTA,
Forest Service (USDA), Grand Rapids, Minn. Northern Conifers Lab.
For primary bibliographic entry see Field 04C.
W73-03547

POTENTIAL ECONOMIC VALUES OF WEATHER MODIFICATION ON GREAT PLAINS GRASSLANDS,
South Dakota School of Mines and Technology, Rapid City.
E. A. Hausle.
J Range Manage, Vol 25, No 2, p 92-95, 1972.

Identifiers: *Cost-benefit analysis, Clouds, Economic value, Forage, Grasslands, Great Plains, Seeding, *Weather modification.

Experimental weather modification projects on the Great Plains indicate that selective cloud seeding during the summer months may produce from 0.5 to 1 in of moisture. To determine the potential economic benefits from this amount of moisture long term forage production and meteorological data from 3 range sites in Kansas were statistically analyzed. Forage production was highly correlated with growing season moisture. On each of the 3 sites benefit-cost ratios were favorable, ranging from 21.7 to 1 on site 1, 6.4 to 1 on site 2 and 25.2 to 1 on site 3 based on a seeding cost of $0.10/acre and a 0.5 inch increase in rainfall.--Copyright 1972, Biological Abstracts, Inc.
W73-03725

WELL REHABILITATION WITH PRIMACORD,
Illinois State Water Survey, Urbana.
H. F. Smith.
Water Well Journal, Vol 13, No 12, p 18, December 1959.

Descriptors: Water wells, *Explosives, Sandstones, *Scaling, Illinois, *Water yield improvement.
Identifiers: Well yield, *Primacord, Incrustation, *Well rehabilitation.

Primacord, formerly used as a demolition explosive, is finding acceptance in the water well industry as an explosive for increasing the yield of wells which have lost production because of incrustation. Primacord is made as a cord with the explosive evenly distributed throughout its length. The explosive charge is light, averaging about 50 grains per foot. Three deep sandstone wells in Illinois which had been rehabilitated using this material were found to significantly increase in yield, one more than triple. (Smith-NWWA)
W73-03829

3C. Use of Water of Impaired Quality

EVALUATION OF CANAL LINING FOR SALINITY CONTROL IN GRAND VALLEY,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05G.
W73-03518

A SURVEY OF THE SUBSURFACE SALINE WATER OF TEXAS, VOLUME I,
Core Labs., Inc., Dallas, Tex.
For primary bibliographic entry see Field 07C.
W73-03524

IMPLEMENTING THE CHICAGO PRAIRIE PLAN,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 05E.
W73-03649

SOME CHEMICAL PROPERTIES OF SOILS FROM AREAS OF BARLEY GRASS (HORDEUM MURINUM L.) INFESTATION,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 02G.
W73-03772

GROWING BARLEY (HORDEUM VULGARE L.) ON BEDS IN SALINE SOIL,
Arizona Agricultural Experiment Station, Tucson.
A. D. Day, F. Turner, Jr., and R. M. Kirkpatrick.
Agronomy Journal, Vol 63, No 5, p 768-769, 1971. 3 tab, 9 ref.

Descriptors: *Barley, *Saline soils, *Application methods, *Rates of application, Salinity, Weeds, Growth rates, Crop production.
Identifiers: Barley culture.

Studies were conducted over a 2-year period at Stafford, Arizona, to compare two methods (conventional drilling and two rows per bed) and two rates (28 and 56 kg/ha) of planting spring barley (Hordeum volgare L.) on elevated beds in saline soil. Beds were oriented in two directions: north to south and east to west. Conventional drilling on beds resulted in both higher grain yields and grain volume-weights than did the two-row method of planting. Planting 56 kg/ha resulted in higher grain yields and volume weights than did planting 28 kg/ha. Grain yields were higher from barley grown on east-west beds than from barley grown on north-south beds. The two-row method of planting on beds resulted in more weeds than did the drilled method of planting. The research indicated that when barley was grown in saline soil, highest yields of quality grain were obtained when the crop was drilled at 56 kg/ha on east-west beds. (Skogerboe - Colorado State)
W73-03777

3D. Conservation in Domestic and Municipal Use

URBAN-METROPOLITAN INSTITUTIONS FOR WATER PLANNING, DEVELOPMENT AND MANAGEMENT: AN ANALYSIS OF USAGES OF THE TERM'INSTITUTIONS,'
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 06E.
W73-03253

SEARCHING THE SOCIAL SCIENCE LITERATURE ON WATER: A GUIDE TO SELECTED INFORMATION STORAGE AND RETRIEVAL SYSTEMS PRELIMINARY VERSION,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 06E.
W73-03254

INSTITUTIONS FOR URBAN-METROPOLITAN WATER MANAGEMENT: ESSAYS IN SOCIAL THEORY,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 06E.
W73-03255

WATER SERVICE PRICES: A PRINCIPAL COMPONENT AND REGRESSION ANALYSIS OF DETERMINANTS,
West Virginia Univ., Morgantown, W. Va. Regional Research Inst.
For primary bibliographic entry see Field 06C.
W73-03256

CULTURAL BENEFITS FROM METROPOLITAN RIVER RECREATION - SAN ANTONIO PROTOTYPE,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 06B.
W73-03270

PLANNING OF OPTIMAL URBAN WATER SUPPLY SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 06A.
W73-03399

THE ECONOMICS OF DESALTING BRACKISH WATERS FOR REGIONAL, MUNICIPAL AND INDUSTRIAL WATER SUPPLY IN WEST TEXAS,
Parsons (Ralph M.) Co., Los Angeles, Calif.
For primary bibliographic entry see Field 03A.
W73-03433

OPTIMAL DESIGN OF URBAN WASTEWATER COLLECTION NETWORKS,
Duke Univ., Durham, N.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-03693

LOW FLOWS AND TEMPERATURES OF STREAMS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 04C.
W73-03739

EMERGENCY GROUND-WATER SUPPLIES IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 04B.
W73-03740

3E. Conservation in Industry

THE ECONOMICS OF DESALTING BRACKISH WATERS FOR REGIONAL, MUNICIPAL AND INDUSTRIAL WATER SUPPLY IN WEST TEXAS,
Parsons (Ralph M.) Co., Los Angeles, Calif.
For primary bibliographic entry see Field 03A.
W73-03433

3F. Conservation in Agriculture

LOSS OF FERTILIZER NUTRIENTS FROM SOILS TO DRAINAGE WATERS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 05B.
W73-03400

CONTRIBUTION OF FERTILIZERS TO THE POLLUTION OF WATERS IN THE NORTH CAROLINA COASTAL PLAIN,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W73-03402

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS 1968-1969,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05G.
W73-03508

AGROHYDROLOGICAL PROPERTIES OF TRANSBAIKALIAN SOIL (IN RUSSIAN).

Gidrometeoizdat: Leningrad. 1970. 270p. Illus.
Identifiers: *Soil properties, Capacity, Hydrology, Hydroscopicity, Moisture, Soils, *Transbaikalian soil, USSR, Wilting, Agriculture.

Descriptions of the agrohydrological properties of soils and brief methods of their determination, characterization of the soil cover and agrohydrological characteristics of various types and subtypes are given. Reference tables and

graphs for maximum hygroscopicity, wilting percentage, field capacity and maximum water capacity are included. Texture is represented graphically, with the different fractions as weight percentages of an oven-dry sample.--Copyright 1972, Biological Abstracts, Inc.
W73-03550

O'NEILL UNIT, MISSOURI RIVER BASIN PROJECT, NEBRASKA.
For primary bibliographic entry see Field 08A.
W73-03584

POLECAT BENCH UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, WYOMING.
For primary bibliographic entry see Field 08A.
W73-03585

NORTH LOUP DIVISION, MISSOURI RIVER BASIN PROJECT, NEBRASKA.
For primary bibliographic entry see Field 08A.
W73-03586

EVALUATION OF GROUND-WATER RESOURCES AND LONG-TERM WATER DEVELOPMENT, PARADISE VALLEY, ARIZONA,
Water Development Corp., Tucson, Ariz.
For primary bibliographic entry see Field 04B.
W73-03643

SOME ELEMENTS IN THE FERTILITY OF ERODED SOILS AND ITS REGULATION IN THE ROSTOV REGION (IN RUSSIAN),
F. A. Mironchenko, and V. A. Cherepanov.
Sb Nauchn Tr Donskogo S-Kh Inst., Vol 6, No 2, p 9-16. 1969.
Identifiers: *Soil treatment, *Soil erosion, Crops, Elements, Fertility, Furrowing, Grass-M, Perennial, Protective, Regulation, Rostov, Rotation, Soils, USSR.

The following measures were recommended for the preservation and improvement of chernozem soil fertility, in addition to general zonal agrotechnical practices: introduction of soil-protective crop rotations with organic and mineral fertilizers, additional agrotechnical practices (plowing and drill sowing across slope, banking of winter fallow, furrowing of interrows, slotting, sowing of perennial grasses), ameliorative afforestation and water-retaining embankments.--Copyright 1972, Biological Abstracts, Inc.
W73-03690

EFFECTS OF SOIL MOISTURE ON THE GROWTH AND FRUITING OF YOUNG SATSUMA ORANGE TREES (IN JAPANESE),
Kagawa Univ., Takamatsu (Japan). Dept. of Horticulture.
H. Inoue, A. T. Suekane, and T. Kinoshita.
Kagawa Daigaku Nogakubu Gakuzyutu Hokoku. Vol 23, No 1, p 27-34. 1971. Illus. English summary.
Identifiers: *Crop production, Soil moisture, Fruiting, Plant growth, Moisture, *Oranges, Satsuma, Soils, Transpiration, Trees.

Soil moisture was maintained at 70%, 50% and 30% for 2 growing seasons. In the first yr, nonbearing trees showed vigorous growth in the 70%-plot. The trees in the 30%-plot showed very poor growth with decreasing transpiration. In the second yr, the trees in the 70%-plot produced larger fruits than in the 50%-plot. All young fruits in the 30%-plot dropped within 80 days after bloom. In the 70%-plot, soil moisture was lowered to 50, 40 and 30% of water capacity in July and Aug. Lowering of soil moisture under 40% inhibited fruit growth and color.--Copyright 1972, Biological Abstracts, Inc.
W73-03700

LONG-TERM EFFECTS OF SOIL MANAGEMENT TREATMENTS ON SOIL PHYSICAL CONDITIONS IN A FACTORIAL CITRUS EXPERIMENT,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 02G.
W73-03701

INFLUENCE OF LONGTIME NITROGEN, PRUNING AND IRRIGATION TREATMENTS UPON YIELD, GROWTH AND LONGEVITY OF 'ELBERTA' AND 'REDHAVEN' PEACH TREES,
North Carolina State Univ., Raleigh.
G. A. Cummings, and W. E. Ballinger.
Hortscience. Vol 7, No 2, p 133-134. 1972. Illus.
Identifiers: *Crop production, *Peaches, Elberta, Growth, Irrigation, Longevity, Nitrogen, Pruning, Redhaven, Treatments.

Irrigation did not influence total yield, growth, or longevity of 'Elberta' or 'Redhaven' peach trees. Yields were depressed when N was reduced to 0.2 kg/tree (approximately 1/2 recommended rate) with both cultivars. Increasing N above the recommended rate did not influence yield. Highest yields were obtained with lightest pruning level but fruit size was reduced. Random tree loss occurred with all treatments but was highest with low N rates.--Copyright 1972, Biological Abstracts, Inc.
W73-03702

REFLECTED RADIATION FROM A SOYBEAN CROP,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
B. L. Blad, and D. G. Baker.
Agron J, Vol 64, No 3, p 277-280, 1972, Illus.
Identifiers: *Solar radiation, Albedo, Crops, Eppley, Glycine max D, Lodging, Moisture, Pyranometer, Radiation, Soils, *Soybeans.

The albedo, defined as the percentage of incoming solar radiation that is reflected, was measured continuously over a soybean crop (Glycine max. (L.) Merr.) during the 1968, 1969, and 1970 growing seasons at St. Paul, Minnesota. The study was undertaken to establish average albedo values for soybeans and to evaluate the effects of increasing crop cover on the albedo. The average daily albedo ranged from 24%-27% with complete soybean cover. The albedo of the moist soil was approximately 10.5% with no cover and increased at the rate of about 1.3% for each 10% increase in crop cover. Because this relationship held true over the entire growing season, it should be possible to accurately estimate soybean cover from albedo measurements once the growth characteristics of a variety have been established. It was also possible during the study to examine the effects of soil moisture and lodging on the soybean albedo. With full cover the albedo decreased at low soil moisture because the soybean leaves wilted and became more vertically oriented, thereby permitting increased penetration of incoming solar radiation. Before canopy closure, particularly early in the season, low soil surface moisture caused a marked increase in albedo. Severe lodging during mid-Aug. 1970 caused a marked decrease in albedo. Failure to properly shield the inverted Eppley pyranometer was shown to cause an increase in the daily average albedo of as much as 7.5% because of internal reflection from the pyranometer dome. An average albedo of 25.9% was obtained for 2 clear days. It was noted on these days that morning albedoes were higher than evening albedoes at the same solar altitudes. This was attributed to temporarily wilted, drooping leaves, and to increased leaf flutter from stronger afternoon winds. The average daily albedo for 2 cloudy days was 24%.--Copyright 1972, Biological Abstracts, Inc.
W73-03712

ACCUMULATIVE EFFECTS OF MANURE AND N ON CONTINUOUS CORN AND CLAY SOIL, I. GROWTH, YIELD, AND NUTRIENT UPTAKE OF CORN,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
J. L. McIntosh, and K. E. Varney.
Agron J., Vol 64, No 3, p 374-379, 1972, Illus.
Identifiers: *Crop production, Farm wastes, Fertilizers, Clays, Climate, *Corn (Field), Growth, Nitrogen, Nutrients, Rainfall, Soils.

Four rates of manure and 5 rates of N were applied yearly in a factorial arrangement to a Panton clay soil (Typic Ochraqualf). Applications of 120 kg/ha of P and 90 kg/ha of K were made each year to all plots. The plots were planted to corn (Zea mays L.). The objectives were to study the effects of continuous corn and manure and N treatments on the physical and chemical properties of the soil and on the growth, yield and mineral composition of the corn plants over a period of at least 5 yr. The results for the latter objective are reported. During years of normal or less than normal rainfall (1965-67), manure application significantly increased yields of corn grain and stover. Averaged over all treatments of N, plots receiving 66 tons/ha of manure yielded 2.04 tons/ha more than no-manure plots. This response is especially significant in that basic applications of P and K had been made and starter P used at planting each year. For these years, the first increment of N (56 kg/ha) increased yields on unmanured plots. Higher applications of N reduced yields. Where manure was applied, there was no significant response to N. During relatively wet years (1968-69), manure had no beneficial effect on corn growth and yield. The highest, or 66 tons/ha, manure application appeared to be detrimental, particularly where N had been applied. N, on the other hand, significantly increased growth rate and yield of corn grain and stover at all levels of manure. For example, plots receiving 224 kg/ha of N yielded 5.51 tons/ha more than no-N plots. Manure treatments increased percentage K by as much as 0.30% in the corn ear leaves but decreased Ca and Mg. Manure had little effect on percentage N and P. In 1969, a wet year, manure reduced N from 2.72 to 2.44% when averaged over all treatments of N. Chemical analysis of small plants showed the same trends as did analysis of ear leaves. Percentages of Al and Fe were high. But Al varied proportionally to applied N and inversely to manure. For all treatments of N, manure decreased Al from 139 to 85 ppm. Manured plots were slightly but consistently higher in soil moisture. Small differences of about 1% were measured when the soil was near saturation (43% moisture). Differences of 2.5% were measured 1 wk later when the soil was near 30% moisture.--Copyright 1972, Biological Abstracts, Inc.
W73-03713

SHELTER-EFFECTS ON MICROCLIMATE, GROWTH AND WATER USE BY IRRIGATED SUGAR BEETS IN THE GREAT PLAINS,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
K. W. Brown, and Norman J. Rosenberg.
Agric Meteorol, Vol 9, No 3/4, p 241-263, 1972, Illus.
Identifiers: *Crop production, *Sugar beets, *Windbreaks, Great Plains, Corn, Air, Carbon, Climate, Growth, Temperature, Vapor, Wind.

Two rows of corn windbreaks spaced at 15 m were used to protect an irrigated sugar beet crop at Scottsbluff, Nebraska. Yield data for wind protected sugar beet crops from 3 consecutive years indicate that yield increases of as much as 25% are possible during years when yields are low. During years of high yield, however, the windbreaks did not increase sugar beet yield further. Except in the immediate vicinity of the windbreak where shading occurred, no differences were found in net radiation between the sheltered and open plots.

The daytime air temperature averaged 1.8 deg C greater and the vapor pressure 4.0 mbar greater in the sheltered plot than in the open. Both air temperature and the water vapor pressure varied as a function of distance from the windbreaks. An area of maximum influence was often observed near the center of the protected plot. Differences between shelter and open were decreased during periods of strong wind. Differences in temperature and vapor pressure between shelter and open were greater during the day than at night. The wind speed at 25 cm above the crop was 40% of that in the open field whenever wind speed in the open was more than 120 cm/sec. The daytime concentration of CO2 was an average of 1 ppm lower in shelter than in the open. Nocturnal concentration was an average of 3.5 ppm greater in shelter. The latter differences were inversely related to wind speed and were greatest when wind direction was perpendicular to the windbreak. Vertical mixing in the atmosphere is, apparently, vigorous enough to prevent significant depletion of CO2 in a windbreak protected field. The 1 ppm lower concentration observed over the sheltered crop should have only a negligible influence on photosynthetic rate. The increase in vapor pressure and the slight decrease in CO2 during the day suggest a decrease in the intensity of turbulent exchange in shelter. The concentration of water vapor exceeds that of CO2 by several orders of magnitude. Decreased turbulent exchange in shelter has, therefore, a far greater influence on the change in concentration of water vapor than of CO2.--Copyright 1972, Biological Abstracts, Inc.
W73-03714

SUPPLEMENTATION OF DRY ANNUAL RANGE BY IRRIGATED PASTURE,
California Univ., Davis. Coll. of Agriculture.
J. C. Hull, C. A. Raguse, and J. P. Guild.
J Range Manage, Vol 25, No 2, p 96-99, 1972, Illus.
Identifiers: *Range management, *Pastures, Cottonseed D, Irrigation, Production, Supplementation, *Cattle.

Supplementation of a low protein, high-fiber, dry annual-range forage by irrigated pasture appears feasible. Data indicate that irrigated pasture can be used to increase the amount, or improve the quality, of beef production, and that it can compete economically with cottonseed meal as a supplemental protein source for cattle grazing dry annual-range forage.--Copyright 1972, Biological Abstracts, Inc.
W73-03716

PASTURE PRODUCTION AND ITS USE IN THE ARID AND SEMI-ARID AREAS OF RAJASTHAN (INDIA) AND KAZAKHSTAN (U.S.S.R.),
Central Arid Zone Research Inst., Jodhpur (India).
A. K. Chakravarty.
Ann Arid Zone, Vol 10, No 1, p 37-42, 1971.
Identifiers: *Crop production, Agropyron desertorum M, Arid areas, Cenchrus ciliaris M, Forage, *India, *Kazakhstan, Kochia prostrata D, *Pasture, *Rajasthan, *USSR.

Animal husbandry is the major occupation of the people living in the arid and semi-arid zones of India and Kazakhstan. Improvement of the grazing resources in therefore the key point in development of animal husbandry. Forage production from natural grasslands varies from 1-30 quintals/ha in Indian arid and semi-arid zones whereas the same varies from 2-5 quintals/ha in similar areas of Kazakhstan. Production from natural grasslands of the arid zone of India was increased by 60% by soil working and seeding with Cenchrus ciliaris and of Kazakhstan was increased by soil working and seeding with Agropyron desertorum and Kochia prostrata. Grazing stress in the pastures of the arid zone of India is comparatively higher than that in Kazakhstan.--Copyright 1972, Biological Abstracts, Inc.
W73-03717

RELEASE OF NITROGEN FROM SULFUR--COATED UREA IN FLOODED SOIL,
National Fertilizer Development Center, Muscle Shoals, Ala.
For primary bibliographic entry see Field 05B.
W73-03759

EFFECTS OF SHORT PERIODS OF ANAEROBIC AND NEAR-ANAEROBIC CONDITIONS ON WATER UPTAKE BY TOBACCO ROOTS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 05C.
W73-03761

PREDICTION OF THE NITROGEN REQUIREMENT OF FIELD CORPS. PART I. THEORETICAL MODELS OF NITROGEN RELEASE,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W73-03762

PREDICTION OF NITROGEN FERTILIZER REQUIREMENTS OF FIELD CROPS. II. APPLICATION OF THEORETICAL MODELS TO MALTING BARLEY,
Forest Service (USDA), La Grande, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 02G.
W73-03763

EFFECT OF A PLASTIC BARRIER UNDER THE NITRATE BAND ON NITROGEN UPTAKE BY PLANTS,
Agricultural Research Service, Watkinsfille, Ga.
C. L. Parks, A. W. White, and F. C. Boswell.
Agronomy Journal, Vol 62, No 4, p 437-439, 1970. 5 tab, 14 ref.

Descriptors: *Nitrogen, Barriers, *Fertilizers, Soil management, *Application methods, *Corn (Field).
Identifiers: *Rye (Secale cereale), Nitrogen uptake, *Plastic barrier.

Field experiments were conducted on a Cecil sandy loam (Typic Hapludults) to test the effeciveness of a physical barrier (plastic trough) placed immediately beneath a band of nitrate fertilizer in preventing loss of fertilizer N from the root zone by leaching, as measured by plant growth and N uptake. Rye (Secale cereale) and corn (Zea mays) were used as test plants to evaluate the effect of the physical barriers upon fall and spring applied N. A split plot design was used for each experiment. Rye was harvested in December, March, and when the grain was in the dough stage. Eight corn plants were harvested from each plot 30, 37, 44, 52, 65, and 88 days after plant emergence. The total N content of plant samples taken at each harvest date was determined. The applied N recovered in the rye forage was 76, 63, and 47 percent for the 45, 90, and 180 kg/ha rates of N, respectively. The applied N recover in the corn grain was 33, 25, and 20 percent for the 68, 136, and 272 kg/ha rates of N, respectively. Placing a physical barrier immediately beneath the fertilizer band did not significantly ($P<0.05$) increase the uptake of N by the plants or the plants' recovery of the fertilizer N. (Skogerboe - Colorado State)
W73-03767

GRAPHIC RELATION OF INTAKE, LENGTH--OF-RUN AND TIME,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
I-pai Wu, and A. A. Bishop.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineering, Vol 96, No IR3, Paper 7506, p 233-240, 1970. 5 fig, 8 ref, 2 append.

Descriptors: *Graphical methods, *Infiltration, Irrigation, *Irrigation efficiency, Irrigation practices, *Surface irrigation.

The total amount of infiltration of surface irrigation expressed as a function of length of run and time is controlled by the advance function of stream inside the furrow (or border) and the infiltration characteristics of soils. Both the advance function and the infiltration intensity function can be expressed as a power function. There is a linear relationship between the time of advance and the opportunity time of infiltration with the total irrigation time as parameters. A simple graphic solution can be developed and used for estimating infiltration along the furrow (or border) at any given time during irrigation including the recession time. The technique is simple and requires no mathematical computation and can be used as a preliminary estimation of infiltration pattern or evaluation of an irrigation system. The shape of the infiltration pattern along the run can be used to determine the distribution efficiency and the application efficiency of surface irrigation. (Skogerboe - Colorado State)
W73-03768

LOSS OF STANDING WATER BY SEEPAGE HALTED WITH FLEXIBLE LINERS.
For primary bibliographic entry see Field 04A.
W73-03769

SUMMER FALLOW SOIL WATER LOSSES ON INTER-MOUNTAIN DRYLAND AND ITS EFFECT ON CROPPING WINTER WHEAT,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
T. W. Massee, and F. H. Siddoway.
Agronomy Journal, Vol 62, No 6, p 722-725, 1970. 4 fig, 2 tab, 6 ref.

Descriptors: *Wheat, *Tillage, Germination, *Root zone, *Water loss, Crop production.
Identifiers: Fallow tillage, Weed growth, Winter wheat (Triticum aestivum L. em Thell).

Intermountain drylands lose water from the root zone during the summer of fallow even though they receive a monthly average of 3.1 cm of precipitation. Soil water content in the 7.5- to 15-cm seed zone at the end of summer fallow was related to soil water content at the time tillage was initiated in the spring. Fall soil water content was not appreciably affected by variations in summer rainfall. Adequate soil water for winter wheat (Triticum aestivum L. em Thell) emergence was best assured by initiating summer fallow tillage when the water content in the 7.5- to 15-cm layer was relatively high, rather than depending on summer rain to rewet this layer. (Skogerboe - Colorado State)
W73-03770

A BIOLOGICAL METHOD FOR EVALUATING SOIL NITROGEN AVAILABILITY AND FORECASTING NITROGEN FERTILIZER NEEDS OF WHEAT,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Agronomy.
J. Amir, and J. Ephrat.
Agronomy Journal, Vol 63, No 3, p 385-388, 1971. 2 tab, 3 fig, 23 ref.

Descriptors: Fertilizers, *Wheat, *Nitrogen, Absorption, *Nutrient requirement, Analytical techniques.
Identifiers: Nitrogen uptake, Nitrogen fertilization, Wheat fertilization, Soil nitrogen availability.

A biological method for evaluating N availability and forecasting N fertilizer needs of wheat (Triticum aestivum L.) is proposed. Spring wheat plants were grown in containers with 8 kg of soil from the field under consideration. Total N up-

take, as determined 60 days after sowing (at the beginning of heading), indicated the potential response of the wheat crop in the field. The test of the method's suitability for practical use was based on the response of the wheat crop to N application in the field. The total N (in milligrams) taken up by the test plants was designated as the nitrogen index of the soil (NI). On the mineral loess soils of the semi-arid Israeli Negev, wheat responded significantly to N fertilization only in fields with NI lower than 100. (Skogerboe - Colorado State)
W73-03774

TILLAGE AND CROP RESIDUE MANAGEMENT DURING SEEDBED PREPARATION FOR CONTINUOUS SPRING WHEAT,
Agricultural Research Service, Mandan, N. Dak.
J. J. Bond, J. F. Power, and W. O. Willis.
Agronomy Journal, Vol 63, No 5, p 784-792, 1971. 2 tab, 7 fig, 2 ref.

Descriptors: *Wheat, Land management, Planting management, *Soil management, *Fertilization, *Tillage, Nitrogen.
Identifiers: Seedbed preparation, Nitrogen fertilization.

Field experiments were conducted to determine the effect of four tillage and crop residue management methods of seedbed preparation on continuous spring wheat (Triticum aestivum L.) receiving four rates of applied N. Effects of tillage and surface-crop residues were separated by seedbed treatments of (a) conventional moldboard tillage, (b) conventional stubble mulch tillage, (c) moldboard tillage with part of the surface residue removed before and replaced after tillage, and (d) moldboard tillage with all surface residue removed before and replaced after tillage. Treatments were evaluated relative to grain yields, yield components, dry-matter production, N uptake, soil nitrate content, soil temperature, plant water use and weed populations. For 3 of 4 years average grain yields (for all N rates) were 1,380, 1,060, 1,380, and 1,330 kg/ha for treatments a, b, c, and d, respectively. Yield reduction with stubble mulch tillage was related to poor weed control (primarily green foxtail) and not to the effects of surface residue per se. Use of fertilizer N failed to overcome yield reduction associated with stubble mulch tillage. (Skogerboe - Colorado State)
W73-03776

MANAGEMENT STRUCTURE FOR IRRIGATION,
Ventura City United Water Conservation District, Calif.
R. A. Smith.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 96, No IR4, Paper 7722, p 475-488, 1970. 2 fig, 18 ref, 1 append.

Descriptors: Communication, *Engineers, Irrigation, *Management, Organizations, *Personnel, *Planning, Policy, *Irrigation, Operation and maintenance.

After engineers build irrigation systems, many continue as operators and become managers by acquiring the concepts and skills of management. This involves shifting from doing work to responsibly supervising others. The physical irrigation system hosts an intricate social structure which utilizes the democratic process to establish policy and to govern operations within a framework of law. Human functions supercede equipment and both require over-improving techniques of operation. Vitalized operations result from the constant quest for improvement. Continual attention must be given to better management methods in order for an irrigation system to effectively perform its intended function. Methods include good communication, careful planning and effective control. Engineers with good personal qualifications can become increasingly effective in motivating subordinates toward better performance by sharpening skills in a self-development campaign. Engineers as managers can thus improve in ability to sponsor proper relationships with board members and others. This leads to an improved acceptance of irrigation system objectives by the public. (Skogerboe - Colorado State)
W73-03778

DEVELOPMENT OF AUTOMATION ON SALT RIVER PROJECT,
Salt River Project Phoenix, Ariz.
For primary bibliographic entry see Field 04A.
W73-03779

PHOSPHORUS REQUIREMENTS FOR TOMATOES AS INFLUENCED BY PLACEMENT,
Agricultural Research Service, Weslaco, Tex. Lower Rio Grande Valley Research and Extension Center.
B. W. Hipp.
Agronomy Journal, Vol 63, No 2, p 203-206, 1970. 3 tab, 5 fig, 8 ref.

Descriptors: *Crop production, *Application methods, *Tomatoes, *Phosphorus, Fertilization, *Texas, Nutrient requirements.
Identifiers: Tomato nutrition, Phosphorus requirements, Seeded tomatoes (Lycopensicon esculentum).

Field evaluations were made to determine the effectiveness of broadcast P versus P placed in a band for direct seeded tomatoes (Lycopersicon esculentum) on three soils common to South Texas and Northern Mexico. Broadcast P was ineffective in producing high yields when soil P levels were low enough that a P response was obtained. Phosphorus concentrations in young tomato plants were much higher with band P than broadcast P. Lateral distance of P placement from the seed row was critical in obtaining maximum early tomato growth. Depth of P placement was very important on clay soil but less so on sandy clay loam soil. (Skogerboe - Colorado State)
W73-03780

DISTRIBUTION OF P, K, CA, MG, B, CU, MN, AND ZN IN PEANUT LINES NEAR MATURITY,
Virginia Polytechnic Inst. and State Univ., Holland. Tidewater Research Station.
D. L. Hallock, D. C. Martens, and M. W. Alexander.
Agronomy Journal, Vol 63, No 2, p 251-256, 1971. 2 fig, 2 tab, 12 ref.

Descriptors: Chemical properties, *Peanuts, *Nutrients, Plant physiology.
Identifiers: *Nutrient distribution.

The nutrient contents of peanuts (Arachis hypogaea L.) grown under nutrient-sufficient conditions were determined in relation to yields of lines derived from 15 cultivars. Four plant portions of the lines, each a single seed selection, representing four market types were analyzed for contents of eight nutrients. In general, the fruit was highest in P and Zn contents and lowest of the four portions in K, Ca, Mg, B, Mn, and Cu contents. The upper central stem leaves were highest in Ca, Mg, Mn, and B contents and intermediate in P, K, Zn, and Cu contents. The first lateral branch leaves were highest in K content, intermediate in P, Ca, Mg, B, and Cu contents and lower in Zn content than the above portions. Copper content was highest and P content lowest in the hypocotyl whereas the other nutrient contents in this portion were generally higher than in the fruit portion only. Lines of the large-seeded Virginia type were generally highest in K, Ca, and B contents, intermediate in Mg content, and lowest in P content of the four types. The small-seeded Virginia type lines were highest in Mg content, equivalent in Cu and Mn content to the large-seeded lines, and intermediate in P and K contents. The Spanish and Valencia lines were highest in P content, lowest in Cu content, but equivalent in the small-seeded Virginia lines in K, Ca, B, and Mn contents. (Skogerboe - Colorado State)
W73-03781

YIELD COMPONENTS AND WATER USE BY SILAGE CORN WITH IRRIGATION, PLASTIC MULCH, NITROGEN FERTILIZATION, AND PLANT SPACING,
Agricultural Research Service, Thorsby, Ala. Water Conservation Research Div.
B. D. Doss, D. C. King, and R. M. Patterson.
Agronomy Journal, Vol 62, No 4, p 541-543, 1970. 5 tab, 1 fig, 7 ref.

Descriptors: *Corn (Field), *Mulching, *Plant populations, Fertilizers, Nitrogen, *Crop production, Irrigation, Consumptive use, Rates of application.
Identifiers: *Row width, Plastic mulch, *Water use efficiency.

Corn was grown on a Lucedale fine sandy loam soil to determine the effects of irrigation, plastic mulch, N rate, row width, and plant population on yield components and water use by corn. Irrigation, plastic mulch, and higher plant population increased the dry matter yields of all plant parts. Closer row width increased dry matter yields of stalks and leaves but slightly decrease ear yields. Nitrogen rate had little or no effect on dry matter yields of any plant part. Stalks comprised an average of 45 percent of the total plant dry weight, ears, 36 percent, and leaves 19 percent. Plastic mulch decreased average daily water use rates during the early part of the growing season but had little effect during the latter part of the season. Row width, plant population level, and N rate had little or no effect on water use rates. Daily water use rates during the season for unirrigated corn averaged 0.29 cm for plastic-dovered plots and 0.31 cm for uncovered plots. Average rates for irrigated corn were 0.34 cm for plastic-covered and 0.47 cm per day for uncovered plots. (Skogerboe - Colorado State)
W73-03782

EFFECT OF MULCHES AND BED CONFIGURATION. II. SOIL TEMPERATURE AND GROWTH AND YIELD RESPONSES OF GRAIN SORGHUM AND CORN,
Agricultural Research Service, Temple, Tex. Soil and Water Conservation Research Div.
J. E. Adams.
Agronomy Journal, Vol 62, No 6, p 785-790, 1970. 1 tab, 7 fig, 17 ref.

Descriptors: *Mulching, *Corn (Field), *Grain sorghum, *Soil temperature, *Plant growth, Evaporation control, *Soil treatment, Crop production, Plastics, Soil management.
Identifiers: Seedbed configuration, Morphological development, *Plastic mulch, *Petroleum mulch.

Clear plastic film and petroleum mulch were used on Austin clay and Houston Black clay to evaluate their effects on soil temperature and on the growth, development, and yield responses of corn (Zea mays L.) and grain sorghum (Sorghum bicolor (L.) Moench). Three bed configurations also were used in conjuction with the mulches with grain sorghum. Mulches had a highly significant effect on average soil temperature at 7.6 cm below the surface. Soil temperature under clear plastic film 3 weeks after planting had increased 2.6, 2.2, and 1.8C at depths of 30, 61, and 91 cm, respectively. Mulches increased the rate of growth of both corn and grain sorghum significantly (5 percent level) and also affected morphological development, with clear plastic having the most effect. Bed configuration had a significant effect

on sorghum growth when used with mulches. Clear plastic mulch accelerated growth and morphological development sufficiently to cause 50 percent bloom to occur 8 to 10 days earlier for both corn and grain sorghum. Clear plastic mulch increased grain sorghum yield significantly, but mulches had no significant effect on corn yield. Bed configuration caused a significant increase in grain sorghum yield in 1964 but had no important effect on yield in 1963. (Skogerboe - Colorado State)
W73-03783

IRRIGATION INVESTIGATIONS IN OTAGO, NEW ZEALAND VI. PHYSICAL PROPERTIES OF SOILS OF THE KUROW DISTRICT,
Department of Agriculture, Mosgiel (New Zealand). Invermay Agricultural Research Center.
For primary bibliographic entry see Field 02G.
W73-03784

WATER DEFICIT EFFECTS ON CORN. I. VEGETATIVE COMPONENTS,
Iowa State Univ., Ames. Dept. of Agronomy.
M. M. Claassen, and R. H. Shaw.
Agronomy Journal, Vol 62, No 5, p 649-652, 1970. 2 fig, 2 tab, 10 ref.

Descriptors: *Corn (Field), Fertility, *Moisture stress, *Moisture deficit, Soil moisture, *Wilting, *Crop production.
Identifiers: Corn growth stages.

Corn was grown in large buried containers and stressed nonrepetitively by cessation of irrigation at nine different times during the season. Each stress treatment consisted of 4 days on which the uppermost, fully-expanded leaves were wilted. Water status of the yield plants was estimated in terms of the relative turgidity (RT) of like-treated plants, soil moisture and other environmental factors. Vegetative component yields were determined in two experiments, the first including the additional factor of limiting soil fertility. Each component was significantly influenced by one or more of the stress periods. Maximum reductions in total vegetative dry matter production of 15 to 17 percent resulted from water deficits approximately 3 weeks before 75 percent silking. Significant increases in stalk weight occurred as a result of stress at late silking and very early ear stages. (See also W73-03786) (Skogerboe - Colorado State)
W73-03785

STUDY ON WATER ABSORPTION BY SEEDS IN CERTAIN BARLEY VARIETIES AND THEIR GERMINATION (IN BULGARIAN),
Higher Inst. of Rural Economics, Sofia (Bulgaria).
L. Lenkov.
Rastenievod Nauki. Vol 8, No 8, p 13-21. 1971. English summary.
Identifiers: *Barley-M, Germination, *Seeds, *Water absorption.

Some peculiarities of the water absorption and germination of seeds were ascertained in laboratory experimentation with 4 barley cultivars from different origins, 2-rowed barley 'Beta Ketzoras' (Hungary) and multirowed varieties 'Ager' (France), 'No. 1241' and 'No. 1337' (Bulgaria). In soaking for 48 hr barley seeds take up water in average of 57% in relation to their initial weight. Of the experimented cultivars, 'No 1337' takes up water most slowly, and 'Ager' most quickly. Seed samples placed on wet filter-paper adsorb more water than seeds soaked in water for the same time. Seeds having adsorbed water of about 34-45% of their initial weight (moisture content of 5-6%) start to germinate. When the absorbed water reaches 50% and more, the percentage of germinated seeds either decreases or remains the same. Barley seeds are quite susceptible to overwetting. Superfluous water retards seed germination. 'Ager' withstands over-wetting comparatively best, while the Bulgarian cultivars 'No. 1241' and 'No. 1337' are more water sensitive. A sample of 100 seeds placed over one sheet of filter paper in a Petri dish with a 10 cm diameter requires 3-4 cm3 of water until recording the energy of germination. Thus, each seed is supplied primarily with water nearly equal to its weight.—Copyright 1972, Biological Abstracts, Inc.
W73-03788

PREDICTING IRRIGATIONS FROM CLIMATIC DATA AND SOIL PARAMETERS,
Salt River Project, Phoenix, Ariz.
C. E. Franzoy, and E. L. Tankersley.
Transactions ASAE, American Society of Agricultural Engineers), Vol 13, No 6, p 814-816, 1970. 4 fig, 4 ref.

Descriptors: *Irrigation efficiency, Irrigation, *Climatic data, *Scheduling, Soils, *Consumptive use, Cotton, Citrus fruits, Forages, Grains (Crops).

The use of climatic data and soil parameters for scheduling irrigations provides control of the soil moisture reservoir essential for optimum yields. Need for efficient use of water is emphasized when water is scarce and costs are high or when soils exhibit poor water movement characteristics which drastically influence yields. Scheduling irrigations with a computer is an excellent supplement to, but not a replacement for, regular field visits. Frequent monitoring at moisture disappearance and replenishment through field observations by experienced personnel is an essential process for detecting variations in actual evapotranspiration and maintaining accurate predictions. On the basis of the results to date, the Jensen predictive approach offers a sound basis for predicting irrigation timing based on climatic data. (Skogerboe - Colorado State)
W73-03789

OPERATION AND MAINTENANCE OF IRRIGATION AND DRAINAGE SYSTEMS: II.--ORGANIZATION FOR OPERATION AND MAINTENANCE.
American Society of Civil Engineers, New York. Committee on Water Laws.
For primary bibliographic entry see Field 04A.
W73-03790

EVAPOTRANSPIRATION FROM A SNAP BEAN CROP,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 02D.
W73-03792

FORAGE YIELD OF SWITCHGRASS (PANICUM VIRGATUM) IN PENNSYLVANIA,
Agricultural Research Service, University Park, Pa. Regional Pasture Research Lab.
C. C. Berg.
Agronomy Journal, Vol 63, No 5, p 785-786, 1971. 1 tab, 5 ref.

Descriptors: *Switchgrass, Forages, *Pennsylvania, *Forage grasses, Fescues.
Identifiers: Warm-season grass, Cool-season grass, Forage yield.

The production of forage by a warm-season grass species (switchgrass, Panicum virgatum L.) was compared with cool-season grasses in the cool, humid northeastern United States. Dry-matter yields were obtained from two varieties of tall fescue (Festuca arundinacea Schreb.) and orchardgrass (Dactylis glomerata L.) and three varieties of switchgrass in 1969. Two other varieties of switchgrass failed to become established and another two did not survive the first winter. Plots were harvested at approximately monthly intervals from May 15 to September 15, 1969. Orchardgrass and tall fescue began growing much earlier in the spring, continued to grow later in the fall, and produced 3,200 to 5,000 kg/ha more dry forage over the entire season than switchgrass. During midsummer the switchgrass varieties produced as much or more dry matter than the cool-season grasses; however, a high value must be placed on the production of forage at this time of year to justify considering switchgrass as a forage species in the cool humid northeastern United States. Yield data were limited to one harvest year (1969) because the switchgrass did not survive the following winter. (Skogerboe-Colorado State)
W73-03797

RESPONSE OF COTTON TO BORON,
Mississippi Agricultural and Forestry Experiment Station, State College.
B. C. Murphy, and J. D. Lancaster.
Agronomy Journal, Vol 63, No 4, p 539-540, 1971. 3 tab, 1 fig, 9 ref.

Descriptors: *Cotton, *Boron, *Crop response, Foliar application, *Application methods, Rates of application.
Identifiers: Soil content, Plant content, Critical boron level.

Field experiments were conducted with rates and methods of application of B to cotton. Broadcast was as effective as drilled, foliar application was as good as soil application, and there was no advantage to a combination of soil and foliar application. A highly soluble source of B was superior to a more slowly soluble one. Young leaves, the third or fourth node from the growing point, were found to have a critical level of about 15 ppm B. Mature leaves occurring at the fifth and sixth nodes from the growing point had a B content of 5 to 10 ppm higher. The critical level of hot-water soluble B in the top 15 cm of soil was in the range of 0.10 to 0.16 ppm. (Skogerboe-Colorado State)
W73-03799

RESPONSE OF LOWLAND RICE TO VARYING LEVELS OF SOIL, WATER, AND FERTILITY MANAGEMENT IN DIFFERENT SEASONS,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
H. K. Pande, and B. N. Mittra.
Agronomy Journal, Vol 62, No 2, p 197-200, 1970. 3 tab, 17 ref.

Descriptors: *Rice, Submergence, Chemical properties, *Fertilization, *Crop production, *Crop response.
Identifiers: Soil manipulation, Atmospheric evaporative demand.

Performance of rice on lateritic soil was studied under three levels each of soil submergence, soil fertilization, and soil manipulation in the two rice growing seasons, aus and boro. In both seasons the grain yield was better under submergence than under saturation. The crop under shallow submergence (5 plus or minus 3 cm) yielded as much as under deeper submergence (10 plus or minus 3 cm). The crop under soil bulk density of 1.68 g/cc or above, obtained through puddling or compaction, grew equally well. With the increasing level of submergence, the P, Fe, and Si contents of grains increased, but, Mn content decreased in the two seasons. (Skogerboe-Colorado State)
W73-03801

DRY MATTER PRODUCTION AND NUTRIENT UPTAKE IN IRRIGATED COTTON (GOSSYPIUM HIRSUTUM),
California Univ., Davis. Dept. of Agronomy and Range Science.
D. M. Bassett, W. D. Anderson, and C. H. E. Werkhoven.

Agronomy Journal, Vol 62, No 2, p 299-303, 1970. 4 fig, 9 ref.

Descriptors: *Cotton, *Nutrient removal, Irrigation, Crop production, *Chemical analysis, *Distribution.
Identifiers: San Joaquin Valley (Calif), Seasonal uptake.

Dry-matter production of cotton (Gossypium hirsulum L.) plants in the irrigated San Joaquin Valley of California was slow for 40 to 80 days following seeding, with only 2 to 4 percent of the total season aerial dry matter present at time of first square, and 7 to 10 percent at time of first flower (one-fourth to one-tenth of the percentages reported elsewhere for these stages). One-third of the total seasonal dry matter was produced in a 2-week period in August. Total dry matter ranged from 6,900 to 8,900 kg/ha, distributed in mature plants as stems, 23.1 percent; leaves, 17.4 percent; burs, 16.3 percent; seed, 25.3 percent; and lint, 17.9 percent. The proportion of lint was at least 50 percent higher than reported from early research in other areas. Amounts of N, P, K, Ca, Mg, and Na accumulated in the aboveground parts at first flower were less than 15 percent of the final amounts. Of total seasonal uptake, 45 percent of N and P occurred in July and 67 percent of K in the 6 weeks beginning July 1. During these peak absorption periods, daily uptake per hectare was 1.5 to 2.0 kg N, 0.17 to 0.34 kg P, and 2.1 to 3.4 kg K. Mature plants contained 142 kg N, 19 kg P, and 127 kg K per hectare. About 70 kg N, 11 kg P, and 21 kg K per hectare were contained in the seed. The amount of dry matter needed to produce 100 units lint contained 10 units N, 1.5 P, and 9 K. More than half of the N and P was in seed, and more than one-third of the K was in the bur. (Skogerboe-Colorado State)
W73-03802

FRUITING IN COTTON AS AFFECTED BY WATER AND NUTRIENT REGIME IN SOIL (IN BULGARIAN),
Academy of Agricultural Sciences, Chirpan (Bulgaria). Inst. of Cotton.
Y. Milkovski, E. Dushev, and G. Nikolov.
Rastenievod Nauki. Vol 8, No 9, p 77-86. 1971. Illus. English summary.
Identifiers: *Crop production, *Soil management, Cotton, Fruiting, Irrigation effects, Nutrients, Regime, Soils, Fertilizers, Soil moisture, Soil treatment.

Experiments with 4 water regimes in soil at 5 levels of mineral fertilizing were carried out in 1964-1966, on leached chernozem-smolnitza soil. The water and nutrient regimes in the soil substantially affect the fruiting in cotton. At optimum soil moisture and optimum nutrient status and especially with the interaction of both factors, the number of bolls retained by the cotton plant sharply increases. There is a well expressed positive correlation between the degree of water supply of the cotton plant, manifested through its total consumptive use of water, and especially the water used during the flowering-boll formation subperiod and the number of bolls retained by the cotton plant. An improved water regime favorably affects the non-shedding of bolls on the first, internal cones of the cotton bush, thus considerably increasing their compactness and economic value. Under the conditions of a good water supply, cotton irrigation at a comparatively high level of mineral fertilizing substantially restricts the shedding of fruit elements of economically most valuable internal cones of fruiting. An increasing consumptive use of water up to 250 mm in the flowering-boll formation stage favors the reproductive process and substantially decreases the percentage of shedding. The total fruiting (total number of fruiting elements, both retained and shed) increases substantially as a result of improved water regime in soil through irrigation. The level of mineral fertilization does not cause regular changes in the total fruiting.--Copyright 1972, Biological Abstracts, Inc.
W73-03806

IRRIGATION REGIME OF NEWLY SOWN LUCERNE (IN BULGARIAN),
Academy of Agricultural Sciences, Pazardzik (Bulgaria). Experiment Station of Irrigated Agriculture.
L. Delchev.
Rastenievod Nauki. Vol 8, No 9, p 87-95. 1971. English summary.
Identifiers: *Crop production, Hay, *Irrigation effects, Lucerne D, Regime.

Irrigation affects considerably the growth and development of newly planted lucerne. A better water supply creates conditions for development of taller and stronger plants with a modified morphological structure. Nonirrigated plants show inhibited growth and reduced tillering. Irrigation contributes to the increase in lucerne hay yields. Irrigated lucerne produces 8390-9330 kg more hay/ha or 3.5-4 times as much as nonirrigated crop. Maintaining antecedent soil moisture at 65-70% of the field capacity greatly favors a newly planted lucerne crop. Such a soil moisture could be maintained by 1-2 irrigations per cutting, depending on the seasonal rainfall. The single water applications range from 800-900 cu m/ha and the total amount of irrigation water given to the crop varies from 4500-5500 cu m/ha. On well levelled grounds and on soils with a suitable slope a lower irrigation regime (55% of the field-moisture capacity) may be maintained by applying only one wetting per cutting but at a higher rate, namely, of 1100 cu m/ha. High antecedent soil moisture as over 85% of the field-moisture capacity leads to an accelerated thinning of lucerne and use of much manpower in its cultivation.--Copyright 1972, Biological Abstracts, Inc.
W73-03807

THE INFLUENCE OF VARIABLE IRRIGATION OF ALFALFA ON SOME CHEMICAL AND STRUCTURAL MODIFICATIONS IN LEACHED CINNAMON-COLORED FOREST SOILS (IN BULGARIAN),
Academy of Agricultural Sciences, Pazardzik (Bulgaria). Experiment Station of Irrigated Agriculture.
L. Delcev.
Rastenievod Nauki. Vol 8, No 8, p 83-91. 1971.
Identifiers: *Crop production, Alfalfa D, Soil chemical properties, Cinnamon-colored soils, Forest soils, Humus, *Irrigation effects, Leached soils, Modifications, Soils.

Soil and plant effects of irrigation were studied in 4 yr of experiments on alfalfa in which the effects of irrigation to 85, 70, or 55% of the field hydration limit or of no irrigation at all were compared. Results showed a modification in some of the soil chemical indexes. For the non-irrigated fields, an increase in soil humus began during the first yr of growth reaching a level of 0.12%, then increased 0.19% and 0.30% during the second and third yr, respectively. However, for the irrigated fields, this increase began during the second yr (0.17%) and reached a level of 0.21% during the third yr. Slight modifications were observed in regular N and hydrolyzable N in the alfalfa during the second and third yr. No notable differences were observed between the fields despite their varied irrigations. A tendency towards a decrease in mobile P was noted and more intense irrigation was found to cause a slight decrease in K also. Irrigation of alfalfa fields improved soil structure; the number of soil particles measuring more than 1 mm in diameter increased while the number of smaller ones decreased thus decreasing the powdery condition of the soil.--Copyright 1972, Biological Abstracts, Inc.
W73-03808

EFFECT OF IRRIGATION, HARVEST INTERVAL, AND NITROGEN ON THE YIELD AND NUTRIENT COMPOSITION OF NAPIERGRASS (PENNISETUM PURPUREUM),
Puerto Rico Univ., Mayaguez. Agricultural Experiment Station.
M. Capiel, and G. L. Ashcroft.
Agron J. Vol 64, No 3, p 396-398. 1971.
Identifiers: *Forages, *Crop production, Composition, Grass M, Harvest interval, Irrigation, Napiergrass, Nitrogen, Nutrients, Pennisetum purpureum M, Proteins, Puerto Rico.

Studies were conducted in a subhumid area of Puerto Rico to investigate the main effect and the interrelations of harvest interval, irrigation, and N fertilization on the yield and nutrient composition of napiergrass (Pennisetum purpureum). Harvest interval exerted the main effect on the dry matter yield of the forage. N fertilization and irrigation also had highly significant effects. Irrigation interacted significantly with harvest interval to influence forage yield. The increase in yield as a result of a longer harvest interval was nearly 92% greater on irrigated than on nonirrigated plots. N fertilization produced a highly significant increase in the protein yield of the forage. No other management treatment appreciably influenced protein yields. Significant negative correlations were obtained between yield and both N and K composition for the forage on the frequently harvested, irrigated plots. Both nutrients were at lower concentration in the forage produced in harvest periods that had high yields.--Copyright 1972, Biological Abstracts, Inc.
W73-03809

STUDY ON INTERRELATIONS OF LUCERNE, RED CLOVER AND ORCHARDGRASS IN IRRIGATED MIXTURES ON CHERNOZEM SOILS IN THE PLEVAN AREA (IN BULGARIAN),
Institut po Furazhite, Pleven (Bulgaria).
I. Popov.
Rastenievod Nauki. Vol 8, No 9, p 97-108. 1971. Illus. English summary.
Identifiers: *Forage mixtures, *Agronomic crops, Bulgaria, Chernozem soils, Clover-D, Grass-M, Grown, Interrelations, Irrigated soils, Lucern-D, Mixtures, Orchardgrass, Pleven, Soils, Yield.

On a 4 yr mean, lucerne alone produced 12,866 kg/ha of dry matter and 2862 kg/ha of crude protein. Red clover and orchard grass had respectively 5.1 and 30.6% lower dry matter and 12.4 and 50.7% lower crude protein yields. Lucerne dominates in 2- and 3-crop mixtures. Red clover in 2- and 3-crop mixtures is strongly inhibited by the lucerne and accounts for a small percentage of the crop stand. In a mixture with orchard grass alone it shows a better growth and development securing a higher yield than when grown alone. Orchard grass associates very well both with lucerne and red clover. In mixtures it develops better than when grown as a pure crop. Orchard grass-lucerne and orchard grass-lucerne-red clover mixed crops are most productive and secure over 10% more dry matter and crude protein compared to lucerne grown alone. Seed proportion of the seeding rate considerably affects the botanical composition of the stand during the first yr of growth. During the second yr the seed proportion influence strongly weakens and in the third and fourth yr it almost entirely disappears as mixtures composed of one and the same crop, seeded at different seed ratios, show nearly equal botanical composition of the stand.--Copyright 1972, Biological Abstracts, Inc.
W73-03810

SEEDING RATE AND METHOD OF SEEDING SOYBEANS GROWN FOR GRAIN AS IRRIGATED AND NON-IRRIGATED CROPS (IN BULGARIAN),
Institut po Furazhite, Pleven (Bulgaria).
I. Petrakieva.
Rastenievod Nauki, Vol 8, No 9, p 109-119, 1971, Illus, English summary.

Identifiers: *Crop production, *Plant management, Bulgaria, Crops, Grain, Irrigation, Methods, Nonirrigated crops, Rates, Seeding, Soybeans.

Field trails were conducted in 1964-1966 for determining the seeding rate and method of seeding soybeans grown for grain as irrigated and non-irrigated crops. Rates of 300, 400, 500, 600, 700 and 800 thousand germinative seeds/ha sown in rows 60 cm apart and in 60 x 25 cm bands were tried. Grain yields of non-irrigated crops, of irrigated crops, varying plant heights, mean number of pods, grains and grain weight per plant, crude protein and crude fats contents, crude protein yield and crude fat yield per decare (1/10 ha) are presented. On the basis of the experimental results recommendation is made to plant the 'Chippewa' and 'Adams' soybean cultivars in the Pleven area at the rate of 300-400 thousand germinative seeds/ha, when grown as non-irrigated, and of 400-500 thousand germinative seeds as an irrigated crop in rows 60 cm apart. Such seeding rates secure most sustained grain yields of high quality.--Copyright 1972, Biological Abstracts, Inc.
W73-03811

A STUDY ON THE CHARACTERISTICS OF RUNOFF IN PADDY FIELD AREA (IN JAPANESE),
Shimane Univ., Matsue (Japan). Faculty of Agriculture.
A. Fukushima, and R. Tanaka.
Bull Fac Agric Shimane Univ. 4. p 140-145, 1970, Illus, English summary.
Identifiers: Hydrographs, Methods, *Paddy, *Runoff.

The unit hydrograph method is useful for practical estimation of the runoff in the paddy field area by evaluating the optimum decay constant. The decay constant tends to increase with the magnitude of rainfall intensity or runoff.--Copyright 1972, Biological Abstracts, Inc.
W73-03812

CONTRIBUTION TO STUDY OF BUFFER STRIP CROPPING METHOD TO CONTROL WATER EROSION IN WEST AFRICA: EXPERIMENTAL RESULTS AND OBSERVATIONS ON THE FIELD (IN FRENCH),
For primary bibliographic entry see Field 04D.
W73-03813

EFFECT OF SUDAN GRASS ON HYDROPHYSICAL PROPERTIES OF SOIL AND ITS FERTILITY UNDER IRRIGATION (IN UKRAINIAN),
V. I. Ostapov, and V. S. Krupko.
Zroshuvane Zemlerobstvo Resp Mizhvid Temat Nauk Zb 9. p 76-80. 1970.
Identifiers: *Soil management, Fertility, Irrigation effects, Nutrients, Minerals, Soils, *Sudan grass.

Irrigated Sudan grass yields large harvests (total plant weight approx. 81 t/ha), and favorably affects the structure of soil, its water permeability and moisture distribution. When manured (N12OP60), a large quantity of crop residues is left in the soil (over 10 t/ha) which, on decomposition, produce approx. 142 kg N/ha. Nonirrigated Sudan grass accumulates much less nutrients in soil, similar to irrigated but unmanured Sudan grass.--Copyright 1972, Biological Abstracts, Inc.
W73-03856

OATS (AVENA SATIVA L.) AS WINTER FORAGE IN SAVANNAH SOIL: EFFECTS OF FERTILIZATION AND IRRIGATION (IN PORTUGUESE),
Universidade Federal de Minas Gerais, Belo Horizonte (Brazil).
H. Vilela, H. A. Moreira, J. A. F. Veloso, and C. S. Pereira.
Arq Esc Vet Univ Fed Minas Gerais. 22: p 103-111. 1970. English summary.
Identifiers: *Crop production, Avena sativa M, Elephant grass, Fertilization, *Forages, Grass M, Irrigation effects, Oats M, Savannah soil, Winter.

The soil was prepared with 500 kg of fertilizer (10% N, 18% P, and 8% K) ha. The amount of seed was 60 kg/ha. The plots were irrigated by spraying weekly until the last cut. During the experiment 3 hand cultivations were made on the plots. The total production was: 50.381 kg of forage in the irrigated/fertilized treatment; 26.859 kg in the irrigated/non-fertilized treatment; 6.791 kg in the non-irrigated/fertilized treatment and finally, 5.383 kg in the non-irrigated/non-fertilized treatment. There was a significant difference level for the irrigated/fertilized and irrigated/non-fertilized. There was no statistic difference between the non-irrigated/fertilized and non-fertilized treatments. The production of oats green forage during winter can only be justified when irrigation is used. There was an increase in production of 87% when irrigation was used and 23% when it was not used. The total forage production in the irrigation/fertilization experiment was satisfactory, being comparable to elephant grass. Although having higher quality, oats green forage compares favorably to elephant grass in production costs.--Copyright 1972, Biological Abstracts, Inc.
W73-03857

USE OF MINERAL FERTILIZERS FOR CORN UNDER IRRIGATION (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Udobrenii i Agropochvovedeniya, Moscow (USSR).
N. I. Vyaznikova.
Agrokhimiya. 3. p 87-91. 1971.
Identifiers: *Crop production, *Soil management, Fertilizers, Irrigation effects, Minerals, Corn (Field).

On shallow chernozem soils in the central part of the piedmont of the Caucasus Mountains that have an unstable moisture content, the greatest yields of corn were obtained from the combined action of irrigation and fertilizers. The effectiveness of the fertilizers increased in proportion to the improvement of the regime water. There was a close interrelationship between the level and proportion of the nutritional elements. Irrigated plants contained more N, P and K. The removal of these elements was much greater under irrigation. The correct combination of fertilizers and watering, while providing high yields of corn, did not impair grain quality.--Copyright 1972, Biological Abstracts, Inc.
W73-03858

CONSUMPTIVE USE OF WATER BY WHEAT GROWN ON LEACHED CHERNOZEM SOILS IN NORTHEAST BULGARIA (IN BULGARIAN),
Academy of Agricultural Sciences, Tolbukhin (Bulgaria). Inst. of Wheat and Sunflowers.
I. Dimitrov.
Rastenievod Nauki, Vol 8, No 9, p 59-75, 1971, Illus, English summary.
Identifiers: *Bulgaria, *Chernozem soils, Fertilizers, Leached soils, *Wheat-M, Water utilization.

The consumptive use of water by non-irrigated and unfertilized wheat varied from 1965-1968 from 3081 to 4620 cu m/ha and in non-irrigated but fertilized wheat at the level of N200P160K60 kg/ha it varied from 3363 to 5053 cu m/ha. Wheat, having received only one pre-seeding water application, showed a consumptive use of water ranging from 3964 to 5279 cu m/ha. The highest consumptive use of water, namely, from 4832 to 5914 cu m/ha, was found in wheat fertilized at the level of N200P160K60 kg/ha, irrigated before seeding and during its vegetation period. The evapo-transpiration by wheat strongly depends on the weather conditions during the growing season and is less dependable on irrigation and fertilizing.--Copyright 1972, Biological Abstracts, Inc.
W73-03872

INFLUENCE OF IRRIGATION COMBINED WITH MINERAL FERTILIZATION ON WHEAT GROWTH AND YIELD, (IN BULGARIAN),
Academy of Agriculture Sciences, Pazardzik (Bulgaria). Experiment Station of Irrigated Agriculture.
N. Kostourski.
Rastenievod Nauki. Vol 8, No 8, p 55-69. 1971. Illus.
Identifiers: *Fertilization, Irrigation, Minerals, *Wheat-M, *Crop yield.

The influence of various conditions of irrigation and mineral fertilization on hydraulic conditions and wheat yield was investigated in experiments conducted in fields with a cinnamon colored forest soil. Irrigation combined with high doses of mineral fertilizers contributed towards improving hydraulic conditions for the plants. According to the degree of dryness, high doses of fertilizer without concurrent irrigation caused a rather severe deterioration of hydraulic conditions. The best yields were obtained using mineral fertilizer in doses of N100P80K60 kg/ha plus 1 autumn irrigation and 2 vegetative irrigations with either a flat field hydration limit of 70% or else with a 70-80-70% limit. These irrigation conditions produced an average annual increase of 60-96% in the effect of fertilization as compared to the effect of fertilization without irrigation.--Copyright 1972, Biological Abstracts, Inc.
W73-03895

PERIODIC CHANGES IN THE IONIC CONCENTRATIONS FO SOME SUBMERGED SOILS OF BIHAR,
Fertilizer Corp. of India, Sindri.
For primary bibliographic entry see Field 02G.
W73-03896

SOME RELATIONSHIPS BETWEEN CONSTITUENTS OF IRRIGATION WATERS AND PROPERTIES OF IRRIGATED SOILS OF WESTERN RAJASTHAN,
Udaipur Univ. (India).
For primary bibliographic entry see Field 02G.
W73-03898

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

EVALUATION OF STREAMFLOW FORECASTS FOR RESERVOIR OPERATION,
Nevada Univ., Reno. Center for Water Resources Research.
J. W. Fordham.
Available from the National Technical Information Service as PB-213 813, $3.00 in paper copy, $0.95 in microfiche. Project Report No. 16, August 1971, 35 p, 7 fig, 7 tab, 17 ref. OWRR A-035-Nev (1), 14-31-0001-3228.

Descriptors: *Streamflow Forecasting, *Reservoir Operation, *Reservoir releases, Multiple-Purpose Projects, *Dynamic Programming, Discharge (Water), *Reservoir storage, Model studies, *Mathematical models.

A method is described wherby a release policy for a storage reservoir may be determined which will maximize expected returns based on storage and probable inflow. This policy is then used to evaluate the worth of improving the forecast for reservoir operation. Mathematical modeling and dynamic programming are utilized to determine operating policy. (Schulke-Nevada)
W73-03268

THE EFFECTS OF AUTHORIZATION FOR WATER IMPOUNDMENTS ON SHORELAND TRANSITION,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 06B.
W73-03269

WATER RESOURCES DATA FOR TEXAS, 1971: PART 1. SURFACE-WATER RECORDS.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W73-03294

A MODEL TO PREDICT MEAN ANNUAL WATERSHED DISCHARGE,
Federal Highway Administration, Washington, D.C.
S. I. Majtenyi.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY7, p 1171-1186, July 1972. 2 fig, 5 tab, 10 ref. append.

Descriptors: *Discharge (Water), *Watersheds (Basins), *Hydrologic models, *Discharge coefficient, *Small watersheds, Mathematical models, Meterological data, Aerial photography, Precipitation (Atmospheric), Forecasting, Evapotranspiration, Soil texture, Drainage density, Runoff, Seepage, Temperature, Hydrologic data, Annual, South Dakota, Hydrology.
Identifiers: Weather effect.

A method was developed to estimate long-term discharge characteristics of small watersheds. These characteristics are influenced by factors other than annual precipitation and annual mean temperature. Two newly established watershed parameters improve long-term discharge prediction techniques. The first watershed parameter may be determined from discharge, precipitation, and temperatures recorded over a few yrs. The second parameter relates to the drainage density, reflecting the soil texture. This study proves that expected long-term discharge from watersheds having high drainage densities is higher than those with low drainage densities, provided all other factors are identical. The consistent evaluation of drainage denisty from aerial photographs requires the application of a system of conventions, which are discussed. (USBR)
W73-03308

PACIFIC NORTHWEST RIVER BASINS COMMISSION, ANNUAL REPORT, FISCAL 1971.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03318

NORTH GEORGIA DEVELOPMENT F.P.C. PROJECT NO. 2354 (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Georgia Power Co., Atlanta.

Available from the National Technical Information Service as PB-208 576D, $3.00 in paper copy, $0.95 in microfiche. February 29, 1972. 25 p, 8 chart.

Descriptors: *Georgia, *Recreation, *Environmental effects, *Multiple purpose projects, Recreation demand, Reservoir operation, Water sports, Recreation facilities, Lakes, Camping, Fishing, Landscaping, Parks, Boating, Swimming, Water skiing, Hydroelectric plants, Land use, Water resources development, Water pollution sources, Fisheries, Wildlife habitats.
Identifiers: *Environmental Impact Statements, *North Georgia Development Project.

The proposed development involves development of a 300-acre recreation complex in the Tallulah Falls area of northern Georgia. The recreation plan would be carried out by Georgia Power Company in conjunction with six existing hydroelectric projects and would serve to complement existing development. The proposed plan would have no adverse effects upon the fish, wildlife, and vegetation of the area and would serve as a deterrent to continued public misuse and abuse of project lands resulting from uncontrolled visitation. The statement discusses land use compatibility, water use compatibility, and the aesthetic impact of the recreation project. The adverse environmental effects caused by grading, excavation, and clearing necessary to install the proposed recreational facilities will be minimal when compared to the adverse effects of uncontrolled visitation and land use without adequate facilities. Public safety measures will be taken. Alternative sites for facilities were considered, however, only those selected were deemed suitable due to the area terrain. (Chavis-Florida)
W73-03320

JACKSONVILLE HARBOR (SECTION 2), NAVIGATION, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 08A.
W73-03351

CARBON HILL WATERSHED, CUSTER COUNTY, MONTANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W73-03352

LONG HOLLOW CREEK CHANNEL CLEARING, NEZ PERCE, IDAHO, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla, Walla, Wash.

Available from the National Technical Information Service as EIS-ID-72-4562-F, $3.75 in paper copy, $0.95 in microfiche. May 26, 1972. 34 p, 2 map.

Descriptors: *Idaho, *Environmental effects, *Channel improvements, *Flood protection, Flood control, Erosion, Stream improvement, Aesthetics, Streamflow, Stream erosion, Flow augmentation, Flood damage, Excavation, Erosion control, Water control, Water management (Applied).
Identifiers: *Environmental Impact Statements, *Long Hollow Creek (Idaho).

This project involves the clearing and reshaping of the channel and the seeding of grass throughout a 5,000-foot reach of Long Hollow Creek through the village of Nez Perce, Idaho. The purpose is to prevent flood damage to Nez Perce. Favorable environmental effect is a reduction in flood damage to the village. Adverse environmental effects include a change in the visual quality of the creek, with the creek taking on a more unnatural appearance; a slight, seasonal increase in bank erosion due to slightly increased flow velocity within the creek; and temporary noise and other disturbances during construction. Alternatives considered included no action, flood plain management, combination flood plain management-channelization programs, a rock-lined flow channel, and upstream flood detention structures. Comments are included from interested sources. (Brackins-Florida)
W73-03354

HARDWICKE V. UNITED STATES (PROPERTY VALUATION MUST CONSIDER POSSIBLE DETRIMENT DUE TO DIVERSION DAM).
For primary bibliographic entry see Field 06E.
W73-03358

DETERMINATION OF CHANNEL CAPACITY OF THE MOKELUMNE RIVER DOWNSTREAM FROM CAMANCHE DAM, SAN JOAQUIN AND SACRAMENTO COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 08B.
W73-03414

OUR RESERVOIR COVER FLOATS ON WATER,
For primary bibliographic entry see Field 05F.
W73-03456

CONTROL OF ALGAE WITH VIRUSES,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05F.
W73-03483

THE EFFECTS OF AGRICULTURAL WASTE WATER TREATMENT ON ALGAL BIOASSAY RESPONSE,
Environmental Protection Agency, San Francisco, Calif. Region X.
For primary bibliographic entry see Field 05C.
W73-03502

A SIMPLIFIED APPROACH TO PREDICT SURFACE RUNOFF AND WATER LOSS HYDROGRAPHS,
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 02E.
W73-03543

DEEP SEEPAGE MANAGEMENT ON HEADWATER KARST WATERSHEDS,
Missouri Univ., Columbia. School of Forestry.
For primary bibliographic entry see Field 04C.
W73-03555

USE OF STORM DRAINAGE MODELS IN URBAN PLANNING.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 04C.
W73-03558

SOURIS-RED-RAINY RIVER BASINS COMMISSION, ANNUAL REPORT FISCAL YEAR 1971.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03559

TOWN OF COUSHATTA, FLOOD PREVENTION PROJECT MEASURE, TWIN VALLEY RC AND D PROJECT, LOUISIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-03560

PENN'S LANDING, DELAWARE RIVER, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.

Available from the National Technical Information Service as EIS-PA-72-4747-F, $5.50 in paper copy, $0.95 in microfiche. May 1972. 65 p, 1 map, 5 fig, 2 photo, 1 append.

Descriptors: *Environmental effects, *Pennsylvania, *Landfills, *Channel improvement, *Area redevelopment, Dredging, City planning, Urban renewal, Urbanization, Community development, Aesthetics, Turbidity, Rivers, Foundations, Transportation, Ships, Bulkheads, Engineering structures.

Identifiers: *Environmental Impact Statements, *Penn's Landing (Pa.), *Delaware River.

The proposed project will permanently remove 110 acres of navigable water of the Delaware River and convert them to filled lands. This landfill phase is part of a comprehensive plan to rehabilitate the deteriorated Penn's Landing waterfront area of downtown Philadelphia into an interrelated complex of uses including offices, apartments, marines and shopping areas. The implementation of the project will require the destruction of usable piers, but this will not have a serious impact on the local shipping industry since the piers proximity of the landfill bulkhead to the main shipping channel, this will be the most likely source of fill. Other alternative sources of fill are under consideration. The dredging of the channel will not upset the environment any more than normal maintenance operations. A temporary increase in turbidity is expected. The urban Penn's Landing site does not present the typical ecological problems encountered in unspoiled marshland areas and thus there will be no net change in loss of wetlands and aquatic marsh areas. The project will increase activity and, in turn, will promote a general stimulation of port business, tourism, and central business entertainment. No other use has been proposed for the area and no other alternatives were considered as feasible as the instant project. (Beardsley-Florida)
W73-03561

CRESCENT CITY HARBOR NAVIGATION PROJECT, DEL NORTE COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 08A.
W73-03564

SOURIS-RED-RAINY RIVER BASINS COMMISSION, ANNUAL REPORT, FISCAL 1970.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03567

CLARION RIVER ACID MINE DRAINAGE ABATEMENT PROGRAM, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 05G.
W73-03569

CANYON LAKES PROJECT, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Recreation, Washington, D.C.
For primary bibliographic entry see Field 06B.
W73-03575

O'NEILL UNIT, MISSOURI RIVER BASIN PROJECT, NEBRASKA.
For primary bibliographic entry see Field 08A.
W73-03584

POLECAT BENCH UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, WYOMING.
For primary bibliographic entry see Field 08A.
W73-03585

NORTH LOUP DIVISION, MISSOURI RIVER BASIN PROJECT, NEBRASKA.
For primary bibliographic entry see Field 08A.
W73-03586

THE CHESAPEAKE AND DELAWARE CANAL.
For primary bibliographic entry see Field 08A.
W73-03587

AMENDMENTS TO THE COMPACT CREATING THE POTOMAC VALLEY CONSERVANCY DISTRICT AND ESTABLISHING THE INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN.
For primary bibliographic entry see Field 06E.
W73-03591

SABINE RIVER BASIN COMPREHENSIVE STUDY.
For primary bibliographic entry see Field 06B.
W73-03593

THE FOREST RADIATION BUDGET--A REVIEW,
Oregon State Univ., Corvallis, School of Forestry.
For primary bibliographic entry see Field 02D.
W73-03654

FORESTRY IN ROMANIA,
F. Tomulescu.
Ministry of Agriculture, Food Industry Silviculture and Waters, Department of Silvilculture: Bucharest, Romania 1971. 99 p. Illus.
Identifiers: Book, *Forestry, Forest management, Resources, Restoration, *Romania.

The general aspects involving physical, geographical and economic conditions, forest resources, natural vegetation zones, and production and protection functions of the forest are discussed. Forest restoration and maintenance, forest protection, management and evaluation, torrent control and degraded land amelioration, and the utilization of the forest minor products are also discussed. Game, hunting and fishing in the mountain rivers, forest scientific research, designing and education. organization and leadership and some future concerns and tasks of Romania's forestry are described.--Copyright 1972, Biological Abstracts, Inc.
W73-03704

VEGETATION PATTERNS AND SITE RELATIONSHIPS IN THE SASKATCHEWAN RIVER DELTA,
Canadian Wildlife Service, Saskatoon (Saskatchewan).
H. J. Dirschl, and R. T. Coupland.
Can J Bot. Vol 50, No 3, p 647-675. 1972. Illus.
Identifiers: Air, Bog, Canada, Components, Delta, Fen, Forests, Moisture, Nutrients, Patterns, Photos, Relationships, *Saskatchewan River, Sites, *Vegetation, Hydrogen ion concentration.

This 5-yr study attempted to order the landscape pattern of the flood plain complex in the Saskatchewan River delta. The approach involved a stepwise progression, from traditional, subjective classification of the vegetation and mapping by air photo interpretation, to objective classification using association analysis, and final verification by stand and species ordinations through principal component analysis of bog, fen, and mixed forest types. Associations analysis efficiently separated the wide vegetational variation according to discontinuities in species composition. The terminal groups of stands showed pronounced affinities for distinct positions in the landscape. The application of principal component analysis to these landscape units showed moisture regime, nutrient status, and pH to be the most significant gradients controlling distribution of species and communities. The interactions of these factors with each other, and with several physical characteristics, were revealed.--Copyright 1972, Biological Abstracts, Inc.
W73-03709

MICROCLIMATE MODIFICATION BY SLAT-FENCE WINDBREAKS,
Agricultural Research Service, Manhattan, Kans. Soil and Water Conservation Research Div.
E. L. Skidmore, L. J. Hagen, and H. S. Jacobs.
Agron J., Vol 64, No 2, p 160-162, 1972, Illus.
Identifiers: *Microclimatology, Fences, Modification, Slats, Temperature, *Windbreaks.

The influence of windbreaks on the microclimate has been widely studied, but more information is needed on the dynamics of wind barriers and how they modify the microclimate. Meteorological parameters were measured in the spatial vicinity of slat-fence windbreaks of 0, 40, and 60% porosity to characterize microclimate modification by windbreaks of various porosities. The highest daytime air temperature, lowest nighttime air temperature, and generally the greatest vertical temperature differences all occurred in the area of lowest windspeed. However, lowest windspeeds occurred at different locations for the different porosity windbreaks. The water-vapor-pressure and vapor-pressure differences between 40 and 5 cm above the crop surface were greatest at 2H leeward of the solid and 40-percent-open barriers throughout most of the daylight hours, whereas the vapor pressure at 2H leeward of the 60%-open barrier was similar to vapor pressure at other leeward positions. The vapor pressure was lower at 12H leeward of all barriers than in the open field. Bowen ratios indicated that evapotranspiration was greater in the sheltered area than in the open, contrary to earlier findings of less evaporation from evaporimeters leeward of similar barriers. Possible explanations of this anomaly are lower potential evaporation in the shelter, leaving the plants more passive to transpiration and unaccounted-for horizontal divergence of sensible and latent heat in the sheltered area.--Copyright 1972, Biological Abstracts, Inc.
W73-03721

HYDROLOGY OF THE WEST FORK DRAINAGE OF THE GALLATIN RIVER, SOUTHWESTERN MONTANA, PRIOR TO COMMERCIAL RECREATIONAL DEVELOPMENT,
Montana Bureau of Mines and Geology, Butte.
For primary bibliographic entry see Field 04B.
W73-03743

STREAMFLOW COMPUTATIONS AND FORECASTS (RASCHETY I PROGNOZY STOKA REK).
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).

Dal'nevostochnyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 35, Glubokov, V. N., editor, Leningrad, 1971. 156 p.

Descriptors: *Forecasting, *Measurement, *Streamflow, *Discharge (Water), Stage-discharge relations, Flood discharge, Surface-groundwater relationships, Rainfall-runoff relationships, Storm runoff, Hydrographs, Water balance, Water storage, Soil mositure, Melt water, Snow, Ice, Sediment discharge, Avalanches, Orography, Meteorology.
Identifiers: *USSR, *East Siberia, *Soviet Far East, *River hydrology, *Minimum flow, Ice properties, Snow avalanches, Aufeis, Coaxial graphical method, Water-balance equation.

This collection of 20 papers deals with various problems of river hydrology as they relate to conditions in East Siberia and Soviet Far East. Discreteness of hydrometeorological fields in monsoon mountainous regions is examined together with techniques for computing and forecasting minimum flows and runoff from melt water for seasonal water-yield forecasting. Individual papers are concerned with problems of sediment discharge, avalanche-snow evolution, and soil-moisture determinations. (See W73-03748 thru W73-03757) (Josefson-USGS)
W73-03747

FORECAST OF A STORM-FLOOD HYDROGRAPH FOR RIVERS OF EASTERN TRANSBAYKAL BASED ON PRECIPITATION AND RUNOFF (PROGNOZ GIDROGRAFA DOZHDEVYKH PAVODKOV REK VOSTOCHNOGO ZABAYKAL'YA NA OSNOVE KOMPLEKSNOGO UCHETA SUMMARNOGO PRITOKA V RUSLOVUYU SET' I OSADKOV),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
A. V. Bystrov.
In: Raschety i prognozy stoka rek; Dal'nevostochnyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 35, Leningrad, p 58-65, 1971. 2 fig, 10 ref.

Descriptors: *Flood forecasting, *Hydrograph analysis, *Storm runoff, *Rainfall-runoff relationships, *Rivers, Flow, Discharge (Water), Time lag, Correlation analysis, Probability, Equations.
Identifiers: *USSR, *Transbaykal, Chita Oblast, Coaxial graphical method, Coaxial correlation, Water-balance equation.

To illustrate the manner in which forecasts of a flood hydrograph are formulated, investigations were conducted in the Borzya River basin in southeastern Chita Oblast. Inflow at the time of forecast was determined from hydrometric data, and estimates of flow for an ensuing period of days were obtained from precipitation. Construction of a runoff hydrograph was based on precipitation, basin lag time, and the shape of the unit discharge hydrograph. Water-discharge forecasts were made by the coaxial method of graphical correlation of variables which describe storm runoff losses and regulating capacity of the channel system. The probability of achieving the allowable forecast error is 75%. (See also W73-03747) (Josefson-USGS)
W73-03748

FORECAST OF A STORM-FLOOD HYDROGRAPH BASED ON PRECIPITATION AND BASIN LAG (PROGNOZ GIDROGRAFA DOZHDEVYKH PAVODKOV PO OSADKAM S UCHETOM BASSEYNOVOY TRANSFORMATSII),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
E. A. Popova.
In: Raschety i prognozy stoka rek; Dal'nevostochnyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 35, Leningrad, p 66-70, 1971. 1 fig, 2 tab, 4 ref.

Descriptors: *Flood forecasting, *Hydrograph analysis, *Storm runoff, *Rainfall-runoff relationships, *Time lag, Water levels, Flow, Streamflow forecasting, Correlation analysis, Probability, Equations.
Identifiers: *USSR, *Soviet Far East, Amur Oblast, Coaxial graphical method, Coaxial correlation.

Techniques used to formulate a storm-flood forecast based on precipitation were developed for the Selemdzha River above the Ekimchan gaging station in Amur Oblast. Streamflow was computed on the basis of precipitation and a family of unit basin lag curves. Streamflow forecasts were made by the coaxial method of graphical correlation of four variables. The probability of achieving an allowable forecast error of 0.45 is 88%. (See also W73-03747) (Josefson-USGS)
W73-03749

TECHNIQUES FOR FORECASTING PRESPRING MINIMUM WATER LEVELS OF THE AMUR RIVER (PREDVESENNIYE MINIMAL'NYYE UROVNI VODY R. AMURA I METODIKA IKH PROGNOZIROVANIYA),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
Z. P. Lobovikova.
In: Raschety i prognozy stoka rek; Dal'nevostochnyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 35, Leningrad, p 71-76, 1971. 3 fig, 1 ref.

Descriptors: *River forecasting, *Water levels, *Stage-discharge relations, *Surface-groundwater relationships, Water storage, Runoff, Low flow, Antecedent precipitation, Probability, Seasonal.
Identifiers: *USSR, *Soviet Far East, Amur River.

Winter low flow and low stages of rivers in the Amur basin were investigated for formulation of a forecast of minimum water levels based on antecedent discharges for 1, 2, or more years. Winter low flow is dependent upon groundwater storage. The parameters used to describe this storage are: atmospheric precipitation during the warm season; average monthly surface-water level for December; and maximum surface-water level in summer. By correlating minimum prespring Amur water levels with maximum groundwater levels, a forecast can be prepared 1 to 5 months in advance. The probability of achieving the allowable forecast error is 80%-94%. (See also W73-03747) (Josefson-USGS)
W73-03750

USE OF CORRECTION TO COMPUTE MAXIMUM STORM-FLOOD DISCHARGES ON RIVERS IN THE SOUTHERN PART OF THE SOVIET FAR EAST (OTSENKA RASCHETOV MAKSIMAL'NYKH RASKHODOV DOZHDEVYKH PAVODKOV NA REKAKH YUGA DAL'NEGO VOSTOKA PO METODU KORREKTS II),
Far Eastern Hydrometeorological Research Inst., Valadivostok (USSR).
T. G. Ponomareva.
In: Raschety i prognozy stoka rek; Dal'nevostochnyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 35, Leningrad, p 88-92, 1971. 1 fig, 1 tab, 4 ref.

Descriptors: *Discharge (Water), *Flood discharge, *Storm runoff, *Rivers, Basins, Gaging stations, Precipitation (Atmosheric), Equations, *River forecasting.
Identifiers: *USSR, *Soviet Far East, Amur River.

A total of 170 gaging stations in 7 sample basins in lower, middle, and upper reaches of the Amur River were investigated in connection with computation of maximum water discharges. The average computation error is plus or minus 12%, and the maximum computation error is 43%. In most cases, the errors do not exceed plus or minus 30%. By applying correction values to storm-flood runoff from sample basins, maximum discharges can be computed for ungaged rivers in the southern part of the Soviet Far East. (See also W73-03747) (Josefson-USGS)
W73-03751

CHARACTERISTICS OF MINIMUM SUMMER--FALL FLOW ON RIVERS IN THE LAKE KHANKA BASIN (NEKOTORYYE OSOBENNOSTI FORMIROVANIYA MINIMAL'NOGO LENTNE-OSENNEGO STOKA NA REKAKH BASSEYNA OZ. KHANKA),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
A. Ya. Bykadorova.
In: Raschety i prognozy stoka rek; Dal'nevostochnyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 35, Leningrad, p 77-80, 1971. 2 tab, 3 ref.

Descriptors: *Low flow, *Runoff forecasting, *Rivers, *Seasonal, Summer, Autumn, Discharge (Water), Precipitation (Atmospheric), Water storage, Withdrawal, Variability, Equations.
Identifiers: *USSR, *Soviet Far East, *Lake Khanka, Minimum flow.

Minimum flow on rivers in the Lake Khanka basin on the border between Manchuria and the Soviet Maritime Territory was investigated for formulation of a short-term forecast of average 5-day water discharges during a growing season. The forecast is based on a definition of water storage depletion in the basin. Except for June 15-20 and July 5-10, the techniques developed can be applied to all 5-day periods in which inflow is relatively small and nearly constant. (See also W73-03747) (Josefson-USGS)
W73-03752

RELATION OF MINIMUM WINTER RIVER FLOW IN THE UPPER YENISEY BASIN TO AVERAGE BASIN ELEVATION (SYAZ'-MINIMAL'NOGO ZIMNEGO STOKA REK BASSEYNA VERKHNEGO YENISEYA SO SREDNEY VYSOTOY VODOSBORA),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
I. V. Krapivin.
In: Raschety i prognozy stoka rek; Dal'nevostochnyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 35, Lenigrad, p 99-103, 1971. 2 fig, 2 ref.

Descriptors: *Low flow, *Rivers, *Basins, *Elevation, *Winter, Geology, Hydrogeology, Orography, Precipitation (Atmospheric), Discharge (Water).
Identifiers: *USSR, *Yenisey River, *Minimum flow.

Hydrogeological conditions in the Upper Yenisey basin in Krasnoyarsk Territory were investigated to determine the relation between average basin elevation and average monthly minimum winter flow. Minimum winter discharges range from 0.10 liter/sec/sq km in steppe and forest-steppe regions to 5.9 liter/sec/sq km in the mountains. The relations obtained can be used to determine average monthly minimum winter flow on ungaged rivers with drainage areas of 200 to 10,000 sq km. (See also W73-03747) (Josefson-USGS)
W73-03753

WATER-BALANCE STUDIES ON RIVERS IN NORTHEAST USSR (ISSLEDOVANIYA VODNOGO BALANSA NA REKAKH SEVERO--VOSTOKA SSSR),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
A. S. Kuznetsov, and Sh. S. Nasybulin.
In: Raschety i prognozy stoka rek; Dal'nevostochnyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 35, Lenigrad, p 108-112, 1971. 1 ref.

Descriptors: *Water balance, *Evaporation, *Water storage, *Rivers, *Analytical techniques, Measurement, Evaporation pans, Precipitation gages, Topography, Orography, Climatology, Meteorology, Snow surveys, Precipitation (Atmospheric), Runoff, Soils, Soil water, Soil moisture, Moisture content, Talus.
Identifiers: *USSR, *Soviet Far East, Kolyma River, Soil monolith blocks, Snow courses.

A review is given of water-balance investigations in the upper Kolyma River basin in Magadan Oblast in 1968-69. Improved methods of measuring evaporation from soils and changes in soil moisture content are described. The effect of talus on precipitation losses in the basin is considered. (See also W73-03747) (Josefson-USGS)
W73-03754

RELIABILITY OF SOIL-MOISTURE DETERMINATIONS (O NADEZHNOSTI METODOV OPREDELENIYA VLAGOZAPASOV V POCHVE),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
V. N. Glubokov.

In: Raschety i prognozy stoka rek; Dal'nevostochnyy Nauchnoissledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 35, Leningrad, p 113-121, 1971. 1 fig, 4 tab, 5 ref.

Descriptors: *Soil water, *Soil moisture, *Water storage, *Water balance, *Measurement, Soils, Soil profiles, Soil horizons, Bulk density, Zone of aeration, Variability, Seasonal.
Identifiers: *USSR, *Soviet Far East, Maritime Territory.

Investigations were carried out at 3 meteorological stations in the Maritime Territory in 1967-70 for accurate soil-moisture measurements. The presence of large spatial and temporal variations in soils reduces the accuracy of soil-moisture determinations by plus or minus 10%-15%. The accuracy of measuring soil moisture and soil-moisture changes is, in most cases, comparable to that of determining other items in the water balance. Bulk-denisty determinations of soils can be modified to exclude the effects of spatial and seasonal variations. Improved methods of expressing bulk density make present methods of soil-moisture determinations in the zone of aeration completely reliable in water-balance calculations. (See also W73-03747) (Josefson-USGS)
W73-03755

INVESTIGATION OF RADIATION AND MECHANICAL PROPERTIES AND CALCULATION OF THAWING OF ICE COVER ON THE USSURI RIVER (ISSLEDOVANIYE RADIATSIONNYKH I MEKHANICHESKIKH SVOYSTV I RASCHET TAYANIYA LEDYANOGO POKROVA R. USSURI),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
V. M. Timchenko.
In: Raschety i prognozy stoka rek; Dal'nevostochnyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 35, Leningrad, p 126-134, 1971. 1 fig, 2 tab, 6 ref.

Descriptors: *Ice, *Ice cover, *Thawing, *Machanical properties, *Radiation, Solar radiation, Heat, Heat balance, Heat flow, Albedo, Ice breakup, Snow cover, Measurement, On-site investigations, Equations.
Identifiers: *USSR, *Soviet Far East, *Ussuri River, *Ice properties, *Ice structure, Ice thickness, Ice growth, Ice decay, Heat exchange.

To study radiation and mechanical properties of a river snow and ice cover, on-site investigations were carried out on the Ussuri River near Kirovskiy in the Maritime Territory in the spring of 1970. An equation was developed to calculate distribution of absorbed solar radiation in a layer of ice, and a relationship was established between strength of river ice and total amount of heat absorbed by the ice in the form of solar radiation. Calculation of the thawing of river ice in the period between disappearance of snow and ice breakup is tabulated. (See also W73-03747) (Josefson-USGS)
W73-03756

SNOW COVER AND SNOW AVALANCHES IN MOUNTAINS OF KAMCHATKA (SNEZHNYY POKROV I SNEZHNYYE LAVINY V GORAKH KAMCHATKI),
Far Eastern Hydrometeorological Research Inst., Vladivostok (USSR).
Yu. A. Yevtod'yev.
In: Raschety i prognozy stoka rek; Dal'nevostochnyy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 35, Leningrad, p 135-143, 1971. 1 fig, 1 tab, 4 ref.

Descriptors: *Snow, *Snow cover, *Snowpacks, *Avalanches, *Mountains, Slopes, Elevation, Water equivalent, Density, Snowmelt, Snow surveys, Seasonal, Safety.
Identifiers: *USSR, *Soviet Far East, *Kamchatka, *Snow avalanches, *Avalanche hazards, Snow density, Snow depth, Snow courses.

The season of snow accumulation in the mountains of Kamchatka begins in early September and continues to a maximum accumulation at the end of March and beginning of April. The density of snow cover varies between 0.20 and 0.40 g/cu cm, and the water content of snow varies between 100 and 500 mm. The average depth of snow at an elevation of 1,000 m is 170 cm. Favorable conditions for snow-avalanche hazards exist between January and May. The areas of avalanche danger include the entire coast, the southern part of the peninsula, the Central Range (Sredinnyy Khrebet) extending the length of the peninsula, the watersheds of the Avacha and Kamchatka Rivers, the slopes of most volcanoes, and the upper reaches of rivers on the west coast. Despite their occurrence in sparsely inhabited areas, snow avalanches in the mountains of Kamchatka pose a serious threat to the National economy. (See also W73-03747) (Josefson-USGS)
W73-03757

LOSS OF STANDING WATER BY SEEPAGE HALTED WITH FLEXIBLE LINERS.

Irrigation Journal, Vol 21, No 4, p 14-15, July-August, 1971. 3 fig.

Descriptors: *Canal lining, *Seepage losses, Plastics, *Montana, Soil water, Irrigation canals, Waste water, Water control, Water loss.
Identifiers: Helena (Montana), Dillon (Montana).

The loss of water along two stretches of irrigation canal in the Helena dn Dillon areas of Montana was tremendous. Freeze-thaw cycles during the cold season caused the concrete in the bottom of the canals to craze, crack, and pop up. Water losses in the area were calculated to be as high as 48 acre-feet per day over a 2 1/2 mile stretch of the canal. To rectify this condition, the Bureau of Reclamation called for bids to install flexible PVC vinyl membranes in the canals. The membranes were placed on the floor of the canal and up the 2:1 slopes and were covered with 16 inches of soil. The lining resulted in the canals being nearly water tight and will withstand the cold Montana winters. (Skogerboe - Colorado State)
W73-03769

DEVELOPMENT OF AUTOMATION ON SALT RIVER PROJECT,
Salt River Project Phoenix, Ariz.
H. Shipley.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 96, No IR2, Paper 7373, p 151-163, 1970. 13 fig.

Descriptors: *Automatic control, *Irrigation practices, Remote control, Analog computers, Canal design, Digital computers, Gates, Irrigation, Irrigation engineering, Irrigation operation, Irrigation systems, Pumps.
Identifiers: *Salt River Project.

Workload studies and efficiency evaluation of water deliveries plus savings of pump costs justify the installation of automatic supervisory control for irrigation facilities and deepwell pumps. Due to the fact that the Salt River Project irrigation system is the oldest multipurpose irrigation project in the United States and is now in the transition of converting many of the farm lands into urban development, new problems have been created, making this type of installation feasible. The hydraulic design of the gates and changes in operation of the delivery system have been thoroughly studied and integrated into the application of the remote supervisory control. (Skogerboe - Colorado State)
W73-03779

OPERATION AND MAINTENANCE OF IRRIGATION AND DRAINAGE SYSTEMS: II.—ORGANIZATION FOR OPERATION AND MAINTENANCE.
American Society of Civil Engineers, New York. Committee on Water Laws.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97, No IR4, Paper 8613, p 601-633, 1971. 2 fig, 2 ref, append.

Descriptors: *Drainage, *Maintenance, *Organizations, *Water management, *Construction, *Irrigation, Operations, Personnel, Water resources.
Identifiers: Public land policy, Organization charts, Public opinion.

As an irrigation or drainage system is constructed, the transition toward its intended function begins. The organization to perform this function centers around operation and maintenance personnel; however, additional construction functions may be included until project completion. Organizational systems having this responsibility are reviewed. The function of the policy-setting bodies and operating personnel, together with methods for accomplishing their responsibilities, are also reviewed. (Skogerboe - Colorado State)
W73-03790

MATHEMATICAL MODEL OF LEAKY AQUIFER,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 02F.
W73-03795

DRAWDOWNS DUE TO CYCLIC PUMPING,
Research Council of Alberta, Edmonton.
D. H. Lennox, and A. Vanden Berg.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 93, No 6, p 35-51, November 1967. 4 fig, 1 tab.

Descriptors: *Pump testing, *Drawdown, Water wells, Aquifer testing, Discharge (Water), Theis equation, *Mathematical studies, Computer models, Artesian aquifers.
Identifiers: *Cyclic pumping.

Equations are developed to describe drawdowns in a nonleaky artesian aquifer when a fully penetrating well is pumped in cyclic fashion. The cyclic pumping may be either simple or complex; if simple, a fixed period of pumping at a specified rate Q as regularly alternated with a fixed period of recovery; if complex, a fixed period of simple cyclic operation is regularly alternated with a fixed period of inactivity. Maximum drawdown in the pumped well may be expressed as the sum of the well-loss component and two formation-loss components: single-period loss and cycling loss. Single-period loss is the total formation loss at the end of the first pumping period; cycling loss involves a function or functions of the cycling parameters only. Different functions of the cycling parameters are applicable under different conditions. (Campbell-NWWA)
W73-03822

WELL REHABILITATION WITH PRIMACORD,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 03B.
W73-03829

SWAMP DRAINAGE IN NORWEGIAN FORESTRY: INFLUENCE ON WATER BALANCE AND FLOOD DANGER (IN NORWEGIAN),
Norske Skogforsoksvesen, Vollebekk. Skogokol. Avdeling.
F. H. Braekke.
Tidsskr Skogbruk. Vol 78, No 2, p 227-238. 1970. Illus. English summary.

Identifiers: *Drainage effects, Danger, Drainage, Floods, Forestry, Norway, *Swamps, Peat.

Degree of humification, pore-space, water content and permeability of peat are of great importance for water economy in peat-land areas. When swamps are drained, flood-flow from these areas usually diminishes, and runoff in the vegetative period will increase. When productive forests are established on the swamp areas, flood peaks become insignificant, and summer runoff also decreases. Factors related to climatic conditions such as deep snow in the mountain regions which produce large quantities of spring thaw water, are of far greater importance and affect drainage intensity.–Copyright 1972, Biological Abstracts, Inc.
W73-03851

RESTITUTION TO THE SOIL OF MINERAL ELEMENTS BY LITTER FALL AND PRECIPITATION IN FOUR FOREST STANDS IN EASTERN FRANCE (IN FRENCH),
Centre National de Recherches Forestieres, Nancy (France). Station de Sylviculture et de Production.
For primary bibliographic entry see Field 02G.
W73-03853

4B. Groundwater Management

CONJUNCTIVE USE OF GROUND AND SURFACE WATERS,
Nebraska Univ., Lincoln.
Richard S. Harnsberger.
Available from the National Technical Information Service as PB-213 810, $3.00 in paper copy, $0.95 in microfiche. Project Completion Report, June 1972. OWRR B-007-NEB (1), 14-31-0001-3301.

Descriptors: *Conjunctive use, *Inter-basin transfers, Diversions, Water law, Riparian rights, *Prior Appropriation, *Nebraska, Underground storage, Groundwater.
Identifiers: *Dual legal systems.

The objectives were to analyze the law pertaining to surface watercourses and groundwater in Nebraska and also to consider in depth the long-standing prohibition against interbasin transfers within the state. Consideration was given to the historical development of Nebraska water statutes; leading Nebraska court decisions pertaining to groundwater, streams and preferences; major attempts to obtain legislative authorization for interbasin transfers in Nebraska; criteria for legislative delegation of authority to an administrative agency to grant permits for interbasin diversions; growing conflicts between well irrigators and stream appropriators and methods to integrate their uses; Nebraska's dual system of riparian and appropriative rights in streams; condemnation of agricultural rights for industrial uses inside and outside the territorial limits of municipalities; municipal groundwater supplies; conjunctive use; Nebraska's newly created 24 Natural Resources Districts which cover the entire state; and suggested powers, for local districts. Proposed powers covered include standard conditions in permits, practical adjustments, substitute supplies, exchange agreements, pump taxes, extraction charges, perched water tables, critical areas, intervention in litigation and underground storage beneath the lands of others.
W73-03266

GROUNDWATER RESERVOIR RESPONSE TO EARTH TIDES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Geological Science.
For primary bibliographic entry see Field 02F.
W73-03271

THERMAL PROBLEMS IN THE SITING OF REINJECTION WELLS,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W73-03286

COMMENTS ON WATER LAWS IN MINNESOTA,
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 06E.
W73-03311

GEOLOGY OF THE MIDDLETOWN-ODESSA AREA, DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 07C.
W73-03403

GEOLOGY OF THE CHESAPEAKE AND DELAWARE CANAL AREA, DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 07C.
W73-03404

GEOTHERMAL EXPLORATION IN REGION 3 (IMPERIAL VALLEY PROJECT).
Bureau of Reclamation, Boulder City, Nev. Region 3.
For primary bibliographic entry see Field 03B.
W73-03422

GEOTHERMAL EXPLORATION AND DEVELOPMENT IN NEVADA,
Nevada Bureau of Mines and Geology, Reno.
For primary bibliographic entry see Field 03B.
W73-03427

GEOTHERMAL RESOURCES, PRESENT AND FUTURE DEMAND FOR POWER, AND LEGISLATION IN THE STATE OF WYOMING,
Wyoming Univ., Laramie. Dept. of Geology.
For primary bibliographic entry see Field 03B.
W73-03432

REMOVAL OF IRON FROM GROUND WATER BY FILTRATION,
Jadavpur Univ., Calcutta (India).
For primary bibliographic entry see Field 05F.
W73-03473

PYRITIC SYSTEMS: A MATHEMATICAL MODEL,
Ohio State Univ., Research Foundation, Columbus.
For primary bibliographic entry see Field 05B.
W73-03506

FALLOW AND GRAVEL MULCH EFFECTS ON SOIL WATER STORAGE,
Colorado State Univ., Fort Collins.
D. R. Linden.
M Sc Thesis, December 1970. 50 p, 4 fig, 6 tab, 19 ref. OWRR B-013-COLO (1).

Descriptors: *Groundwater resources, *Withdrawal, *Water balance, *Groundwater recharge, *Colorado, Irrigation, Hydrologic budget, Water conservation, Soil treatment, Methodology, Water table, Water level fluctuations, Groundwater movement, Soil moisture, Moisture content, Aquifer characteristics.

Groundwater resources on the high plains of Colorado are being mined for irrigation at a rate surpassing natural recharge of the aquifer. Detailed information on recharge rates, as well as possible methods for increasing recharge, is essential to sound agricultural planning. Various surface soil treatments were investigated in field experiments to determine their effect on groundwater recharge. Plots were established in 1967 on initially very dry soil of semiarid native rangeland. The water table is about 100 feet below the surface. Water content profiles were measured periodically to determine the downward movement of water resulting from the surface treatments. Changes in the total water content of the profile were used to evaluate soil water accumulation and possible groundwater recharge. A 2.5 cm coarse sand and gravel mulch, with vegetation controlled by herbicides, accumulated 50% of the annual precipitation during a two-year period. The sand and gravel mulch with native grass vegetation showed only seasonal fluctuations in the upper 120 cm of the profile with no net accumulation of water. Fallow treatments (chemical and mechanical) did not show significant accumulation until heavy snows in October 1969. Matric potential profiles for various locations on fine-textured soils showed high tension values to considerable depths except where conservation practices or irrigation had been used. (Woodard-USGS)
W73-03521

SUBSURFACE-FLOW INVESTIGATIONS (ISSLEDOVANIYA PODZEMNOGO STOKA).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W73-03525

PRACTICAL PROBLEMS IN THE STUDY OF SURFACE-GROUNDWATER RELATIONSHIPS (PRAKTICHESKIYE ZADACHI V PROBLEME IZUCHENIYA VZAIMODEYSTVIYA POVERKHNOSTNYKH I PODZEMNYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W73-03526

ESTIMATES OF STREAMFLOW VARIABILITY AND GROUNDWATER REPLENISHMENT IN REGIONS OF INTENSIVE GROUNDWATER MINING (OTSENKA IZMENENIY STOKA REK I VOSPOLNENIYA ZAPASOV PODZEMNYKH VOD V RAYONAKH INTENSIVNOY EKSPLUATATSII POSLEDNIKH),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W73-03529

CHARACTERISTICS OF GROUNDWATER IN THE ARMENIAN SSR (NEKOTORYYE OSOBENNOSTI REZHIMA PODZEMNYKH VOD ARMYANSKOY SSR),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02F.
W73-03531

LIMITING CONTAMINATION OF WASTE DISPOSAL WELLS,
Marathon Oil Co., Findlay, Ohio. (assignee).
For primary bibliographic entry see Field 05E.
W73-03616

MUNICIPAL WATER SUPPLIES AND USES, NORTHWESTERN NEW MEXICO,
For primary bibliographic entry see Field 06D.
W73-03641

EVALUATION OF GROUND-WATER RESOURCES AND LONG-TERM WATER DEVELOPMENT, PARADISE VALLEY, ARIZONA,
Water Development Corp., Tucson, Ariz.

L. C. Halpenny, J. W. Harshbarger, and D. K. Greene.
City of Scottsdale, Arizona, January 1967. 45 p, 12 fig, 6 tab, 6 ref.

Descriptors: *Groundwater, *Data collections, *Planning, *Forecasting, *Arizona, Water resource development, Groundwater potential, Groundwater quality, Water demand.
Identifiers: Paradise Valley (Ariz).

The water supply demand is expected to rise from the 1965 requirement of 10 mgd to a 1990 demand of 28 mgd. Because of this, the City of Scottsdale, Arizona authorized this study of the resources and long-term development of groundwater in Paradise Valley. Rainfall in the area is minimal, about 10 to 16 inches annually. Groundwater recharge is estimated at 31,000 acre-feet a year (28 mgd) for the 5 year period of 1961-1965. The development of groundwater supplies to meet the 1990 predicted demand is possible, and the water is of acceptable quality. Surface water supplies could possibly be developed to supply some of the demand, and is of acceptable water quality, but it is considered to be uneconomical. Specific recommendations for Scottsdale are (1) establishment of two water service areas, one north and the other south of Arizona Canal, and (2) development of a public water supply for Scottsdale. The second recommendation can be implemented by five plans, which include, in their order of recommendation: (1) establish a joint Phoenix-Scottsdale municipal water system; (2) obtain lower water rates in areas currently served by Phoenix, and develop a municipal water system for the rest of Scottsdale; (3) establish a water system by purchasing groundwater from the Salt River Project, and developing groundwater outside the Salt River Project boundaries; (4) develop an independent groundwater systems; and (5) set up a system of groundwater for the Northern Service area and a joint surface and groundwater system for the Southern Service area. Implementation of one of these recommendations should be carried out to provide for future anticipated growth of Scottsdale. (Poertner)
W73-03643

GROUNDWATER IN MONTANA.
Montana Water Resources Board, Helena.

Inventory Series Report Number 16, November 1969. 145 p, 59 fig, 3 tab.

Descriptors: *Montana, *Surveys (Data collection), *Groundwater resources, Aquifers, Artesian water, Water wells, Groundwater quality, Water resources management, Groundwater potential, Groundwater geology, Groundwater management, Groundwater depletion, Planning.

In order to inventory the available supplies of groundwater in Montana, published groundwater reports and other reports containing information required in estimating available groundwater supplies were reviewed, summarized and compiled. More than 42,000 wells and 18,000 springs are recorded under provisions of Montana law. Springs are of considerable importance for domestic, stock, municipal and irrigation purposes. Although most of the state is well covered by groundwater data surveys, there are areas where insufficent data are available and nine groundwater studies to gather this data were underway at the time of publication. Information provided in this report includes precipitation, well depth, water table elevation, well yields, capacities, number of wells, water temperature, and well water uses. The quality of groundwater in western Montana is generally good to excellent while in central Montana it is fair to excellent and poor to good in eastern Montana. It is estimated that total perennial recharge is 1.3 million acre-feet and this is the amount that could be utilized from unconsolidated aquifers, which have a storage of 10 million acre-feet. Bedrock aquifer figures for storage and recharge were not computed. (Poertner)
W73-03644

GROUND-WATER CHARACTERISTICS IN A RECHARGE AREA, MAGDALENA MOUNTAINS, SOCORRO COUNTY, NEW MEXICO,
New Mexico Bureau of Mines and Mineral Resources.
W. K. Summers, G. E. Schwab, and L. A. Brandvold.
Circular 124, 1972. 18 p, 14 fig, 6 tab, 8 ref.

Descriptors: *Mineralogy, *Chemical analysis, *Groundwater, *Mining, *New Mexico, Water analysis, Water chemistry, Geochemistry, Correlation analysis, Trace elements, Copper, Zinc, Iron, Chromium, Strontium.
Identifiers: *Magdalena Mountains (N Mex).

Mineral explorationists in New Mexico have indicated that chemical analyses of groundwater samples have become a geochemical prospecting tool. The Magdalena Mountains in south-central New Mexico cover an area of approximately 250 square miles and range in altitude from about 6,000 feet to 10,783 feet. Annual precipitation on the mountains ranges from 13.4 inches at 7,000 feet to 17.7 inches at 10,630 feet. Springs occur at local permeability, barriers in the canyons and arroyos and may be intermittent. Analyses were made for fluoride, nitrate, lithium, rubidium, strontium, barium, chromium, copper, zinc, iron, and manganese. Except for fluoride and strontium, most concentrations were near or below the limit of detectability. The distribution of sample locations and the low solubility of metallic ions somewhat limit the efficacy of trace element analysis to delineate areas for subsequent metals exploration. However, one anomalous copper value occurred in a sample taken from a spring near a known copper deposit, and anomalous zinc values suggest a new area to prospect. Lithium concentration varied with lithology. Concentrations of the other trace elements were not particularly significant. (Woodard-USGS)
W73-03730

EMERGENCY GROUND-WATER SUPPLIES IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
B. L. Foxworthy.
Geological Survey Basic-data Contribution 2, Open-file Report, 1972. 1 sheet, 1 map, 7 ref.

Descriptors: *Groundwater resources, *Aquifers, *Groundwater potential, *Water supply, *Washington, Water wells, Water yield, Water storage, Urbanization.
Identifiers: *Seattle-Tacoma area (Wash), *Emergency groundwater supplies.

Information is presented to provide broad guidance to the availability of groundwater for emergency supplies in the Seattle-Tacoma area, Washington. For example, the array of wells shown, when compared with present or expected distributions of population and (or) water-supply pipelines, might suggest a network of existing wells that could be designated and prepared to yield emergency water supplies for the urban areas. Similarly, the locations of the large-yield wells indicate areas where productive aquifers are present. The large-yield wells would be the most desirable to protect and keep available for emergency use as intensive urbanization proceeds. Groundwater, because it occurs beneath protective soil and rock materials, is less subject to sudden, major contamination than are surface-water bodies. For this reason, and also because of its widespread availability in the Puget Sound region, groundwater is especially desirable as a source of emergency supplies for drinking or other uses requiring water of good quality. (See also W73-03739) (Woodard-USGS)
W73-03740

ORIGIN OF MINERALIZED WATER IN PRECAMBRIAN ROCKS OF THE UPPER PARAIBA BASIN, PARAIBA, BRAZIL,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W73-03741

HYDROLOGY OF THE WEST FORK DRAINAGE OF THE GALLATIN RIVER, SOUTHWESTERN MONTANA, PRIOR TO COMMERCIAL RECREATIONAL DEVELOPMENT,
Montana Bureau of Mines and Geology, Butte.
W. A. Van Voast.
Special Publication 57, February 1972. 19 p, 10 fig, 4 tab, 16 ref. NSF Grant GI-38.

Descriptors: *Hydrology, *Surface waters, *Groundwater, Hydrologic data, *Recreation facilities, *Montana, Water yield, Streamflow, Water wells, Aquifer characteristics, Groundwater movement, Water quality, Temperature, Precipitation (Atmospheric), Runoff, Flow rates, Chemical analysis, Data collections, Land development.
Identifiers: *West Fork Gallatin River (Mont), Predevelopment investigations.

About 40% of the estimated 61,000 acre-feet of average annual runoff and about 50% of the minimum daily discharge leaving the West Fork drainage of the Gallatin River in southwest Montana originates in subdrainages where commercial recreational development is planned. Measured low flows for the 1971 water year were much greater than in most years. Groundwater is available in bedrock and unconsolidated aquifers. Bedrock aquifers include the Madison Group, the Sawtooth Formation, the Swift Formation, the basal part of the Kootenai Formation, and possibly the Quadrant Formation. Unconsolidated deposits as much as 80-feet thick overlie the bedrock in much of the area. Saturated thicknesses as great as 58 feet were penetrated, and yields of as much as 200 gpm were obtained by test wells. Transmissivity values estimated from pumping tests are as much as 50,000 gpd/ft. The unconsolidated aquifer is stream connected, indicating that groundwater use and surface-water use can be interferential. Chemically, water in the unconsolidated aquifer is a calcium magnesium bicarbonate type and suitable for domestic, stock, and irrigation use. (Woodard-USGS)
W73-03743

ANALOG MODEL STUDY OF GROUND-WATER FLOW IN THE REHOBOTH BAY AREA, DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 02L.
W73-03745

IGNEOUS AND METAMORPHIC ROCKS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W73-03830

AQUIFER EVALUATION WITH RADIOISOTOPE WELL LOGS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 08G.
W73-03831

GROUND WATER HYDRAULICS AS A GEOPHYSICAL AID,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 08B.
W73-03832

MANAGEMENT ASPECTS OF GROUND-WATER CONTAMINATION,
Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 05B.
W73-03833

RADIAL COLLECTOR WELLS ADJACENT TO THE RIVER BANK,
Belgrade Univ. (Yugoslavia).
For primary bibliographic entry see Field 08B.
W73-03834

WATER QUALITY DETERMINATION FROM SPONTANEOUS-POTENTIAL ELECTRIC LOG CURVES,
Saskatchewan Univ., Saskatoon. Dept. of Geological Sciences.
For primary bibliographic entry see Field 05B.
W73-03837

INVESTIGATION OF ALLEGED GROUND-WATER CONTAMINATION, TRI-RUE AND RIDE OIL FIELDS, SCURRY COUNTY, TEXAS,
Texas Water Commission, Austin. Ground Water Div.
For primary bibliographic entry see Field 05B.
W73-03839

WATER WELL MANUAL,
Ministry of Works and Hydraulics, Georgetown (Guyana).
For primary bibliographic entry see Field 08B.
W73-03840

REPORTS, HYDROLOGY, 1943, APPENDIX C -- REPORT ON RESEARCH IN THE FIELD OF GROUND WATER BEING CONDUCTED BY OIL COMPANIES,
Geological Survey, Houston, Tex.
N. A. Rose.
Transactions, American Geophysical Union, Part II, p 420-421, January, 1943. 5 ref.

Descriptors: Groundwater movement, Saline water, Brines, Brine disposal, *Research and development, Electrical well logging, Technology, Injection wells, Drilling fluids, Bacteria, *Oil industry, Oil reservoirs.
Identifiers: Salt domes, Horizontal wells, Gravel-packing, *Interdisciplinary studies.

Among the examples given of research by oil companies in the field of ground water are: A study of the mechanics of the formation of salt domes and overhangs by ground water percolation; electrical logging of shallow sections of oil wells, thus providing valuable information on the shallow water-bearing formations; shallow core drilling; the investigation of methods of pumping oil-field brines back into the reservoir sands, thus eliminating the necessity of surface storage and the possibility of shallow groundwater contamination; and gravel-packing of oil wells, which had long before been standard practice in the water well industry. The need for closer cooperation between oil and groundwater industries in their technological development is emphasized. (Campbell-NWWA)
W73-03845

WELL DRILLING METHODS,
Geological Survey, Washington, D.C.
I. Bowman.
Geological Survey Water Supply Paper 257, 139 p, 1911. 25 fig.

Descriptors: *Drilling, *History, Rainfall-runoff relationships, Recharge, Artesian aquifers, *Reviews, *Methodology, Oil wells, Deflection, Costs, Classification, Core drilling, Storage capacity.
Identifiers: Stovepipe (Mud-scow) drilling, *Rigs, Derricks, Fishing.

This is the first comprehensive American contribution to well drilling technology. It explores all important aspects of the state-of-the-art of drilling as of 1911, e.g., aquifers, oil and gas bearing structures, early history, drilling methods, well construction, water well contamination, and well costs. (Campbell-NWWA)
W73-03847

WELL CONTAMINATION--PART III, SOLUTION FOR POLLUTION,
For primary bibliographic entry see Field 05D.
W73-03848

4C. Effects on Water of Man's Non-Water Activities

CERTAINTY, COMPLEXITY AND CURIOSITY-- A NOTE ON STUDYING THE HYDROLOGICAL EFFECTS OF LAND MANAGEMENT CHANGES,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
C. Toebes.
Journal of Hydrology (New Zealand), Vol 11, No 1, p 38-46, 1972. 11 ref.

Descriptors: *Demonstration watersheds, *Research and development, *Reviews, Data collections, Hydrology, Research facilities, Land management, Planning, Projects.

The reasons for carrying out research on the hydrological effects of land management changes are reviewed; the reasons are grouped under the headings of 'certainty', 'complexity' and 'curiosity'. The research techniques used for this type of research are listed and an indication given as to which techniques could be used for given problems. Some ideas are presented as to future research on experimental basins. (Knapp-USGS)
W73-03280

CONTROLLING THERMAL POLLUTION ON SMALL STREAMS,
National Environmental Research Center, Corvallis, Oreg.
For primary bibliographic entry see Field 05G.
W73-03516

STORM SEWER DESIGN -- AN EVALUATION OF THE RRL METHOD,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05D.
W73-03519

WATERSHEDS IN TRANSITION.

Proceedings of Symposium on Watersheds in Transition, S. C. Csallany, T. G. McLaughlin, and W. D. Striffler, editors, held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, 1972. 405 p.

Descriptors: *Conferences, *Watershed management, *Land use, *Environmental effects, Water quality, Water yield, Urbanization, Urban hydrology, Urban runoff, Forest watersheds, Clear-cutting, Water pollution sources, Overland flow, Streamflow, Model studies, Technology, Reviews.

These proceedings of the symposium on watersheds in transition held at Fort Collins, Colo., June 19-22, 1972, include 66 papers divided into six main topics: Objectives, priorities, and problems in watershed management; data requirements and new techniques; snow management; managing agricultural and rangeland watersheds; managing forested watersheds; and managing urban watersheds. A look at most of yesterday's watershed research reflects the predominant role of agriculture in land development. However, an examination of the papers presented in this symposium reveals a shift to problems of urban development and improvement of water yield and water quality to meet the demands of a rapidly expanding and shifting population. The symposium was sponsored by the American Water Resources Association and Colorado State University. (See also W73-03537 thru W73-03558) (Woodard-USGS)
W73-03536

ARE EXISTING MEASUREMENTS OF PRECIPITATION INPUT TO WATERSHEDS ADEQUATE FOR MANAGEMENT DECISIONS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07B.
W73-03537

DATA ACQUISITION FOR WATER QUALITY MANAGEMENT--AN ANALYSIS OF TRADITIONAL GRAB SAMPLING METHODS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 07B.
W73-03538

USING HYDROLOGIC MODELS TO PREDICT THE EFFECTS OF WATERSHED MODIFICATION,
Minnesota Univ., St Paul. Dept. of Agricultural Engineering.
C. L. Larson.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 113-117, 1972. 2 fig, 21 ref.

Descriptors: *Land development, *Environmental effects, *Runoff, *Water quality, *Streamflow, Surface waters, Groundwater, Watersheds (Basins), Water quality control, Model studies, Forecasting, Water yield, Agricultural runoff, Forestry, Construction.

Watersheds are today being subjected to many types of change, both planned and unplanned, which affect our water resources. A change in land use may have either a beneficial or an adverse affect on water resources. In either case, quantitive predictions of these effects are needed before significant land use modifications are undertaken or allowed to occur. Six possible hydrologic effects that might be caused by any of a large number of land use modifications are increase or decrease in: water yield, peak flows, low flows, surface water quality, groundwater supply, and groundwater quality. Hydrologic modeling can be a very useful tool in predicting these effects. Physically-based, measured-parameter models are most readily applied to making these predictions. Conceptual, fitted-parameter models can be used under certain circumstances. Modeling the transport of pollutants by water is an extension of hydrologic modeling and, therefore, the same limitations and general principles apply. (See also W73-03536) (Woodard-USGS)
W73-03539

GENERALIZED COMPUTER MODEL TO SIMULATE THE HYDROLOGY OF A STREAM BASIN,
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 02A.
W73-03540

THE ANALYSIS AND APPLICATION OF A DIGITALLY SIMULATED ELECTRONIC WATERSHED ANALOG,
Arizona Univ., Tuscon. Dept. of Watershed Management.
For primary bibliographic entry see Field 07C.
W73-03541

A METHODOLOGY FOR WATERSHED EVALUATION,
State Univ., of New York, Binghamton. Dept. of Geology.
For primary bibliographic entry see Field 02A.
W73-03542

A SIMPLIFIED APPROACH TO PREDICT SURFACE RUNOFF AND WATER LOSS HYDROGRAPHS,
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 02E.
W73-03543

DEVELOPMENT OF MANAGEMENT GUIDELINES FOR INCREASING SNOWPACK WATER YIELDS FROM PONDEROSA PINE FORESTS IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 03B.
W73-03544

SNOWMELT PEAK FLOWS AND ANTECEDENT PRECIPITATION,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 02C.
W73-03545

A DESIGN FOR CONSERVING WATER AT FLOODWATER-RETARDING STRUCTURES
Agricultural Research Service, Chickasha, Okla. Southern Great-Plains Watershed Research Center.
For primary bibliographic entry see Field 03B.
W73-03546

EFFECT OF AN ASPEN CLEARCUTTING ON WATER YIELD AND QUALITY IN NORTHERN MINNESOTA,
Forest Service (USDA), Grand Rapids, Minn. Northern Conifers Lab.
E. S. Verry.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 276-284, 1972. 7 fig, 4 tab, 19 ref.

Descriptors: *Clear-cutting, *Forests, *Water yield, *Water quality, *Minnesota, Runoff, Effects, Snowmelt, Peak discharge, Streamflow, Forest watersheds, Precipitation (Atmospheric), Vegetation, Soil types, Trees, Lumbering.
Identifiers: *Aspen clear-cutting, Ground cover effects.

Water yield, water quality, and vegetation data following the first year of a complete aspen clear-cutting in Minnesota on the upland portion of a complex, mineral-organic soil watershed are analyzed. Total streamflow increased 31 percent from June through October with no change in the composition of the water. The first spring during clearcutting, snowmelt peak flows were reduced by 35%. The second spring after clearcutting had been completed the previous fall, snowmelt peak flows doubled. In both years peak flows from cleared areas occurred 3 to 4 days before peak flows from forested areas. It is postulated that clearcutting does not affect peak snowmelt flows from large sustained-yield forest. The terrain, vegetation, and climate in which this study was made are typical of extensive areas of the northern Lake States and neighboring Canada. In the Lake States alone, the aspen-birch type covers 15 1/2 million acres and organic soils cover an additional 15 million acres. (See also W73-03536) (Woodard-USGS)
W73-03547

NUTRIENT LOSS FROM CLEARCUTTINGS IN NEW HAMPSHIRE,
Forest Service (USDA), Durham, N.H.
R. S. Pierce, C. W. Martin, C. C. Reeves, G. E. Likens, and F. H. Bormann.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 285-295, 1972. 9 fig, 3 tab, 20 ref.

Descriptors: *Clear-cutting, *Water quality, *Streams, *New Hampshire, *Nutrients, Effects, Vegetation, Soil types, Precipitation (Atmospheric), Overland flow, Runoff, Water pollution sources, Lumbering, Eutrophication.
Identifiers: *Ground cover effects.

Nutrient outflow was measured in stream water from eight clearcut and adjacent uncut forests in the White Mountains of New Hampshire. All clearcuts were made with contemporary practices, and vegetation was allowed to regrow after logging. Substantial changes in ion concentrations were found in all streams draining clearcut areas. Indications are that clearcutting on shallow, infertile, podzolized soils subjects the site to nutrient losses for several years after exposure. Nutrient losses in the first year after clearcutting were about 41 kg/ha for calcium and 38 kg/ha for nitrogen. Losses of these nutrients during the second year were 48 kg/ha and 57 kg/ha, respectively. This loss by leaching removes some of the most readily available nutrients that could otherwise be used for plant regrowth. If adding nitrogen fertilizer has a beneficial effect on regrowth, then loss of nitrogen should have a corresponding adverse effect. (See also W73-03536) (Woodard-USGS)
W73-03548

PLANT NUTRIENT AND SOIL LOSSES IN OVERLAND FLOW FROM BURNED FOREST CLEARCUTS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
N. V. DeByle, and P. E. Packer.
In: Water in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 296-307 1972. 23 fig, 3 tab, 12 ref.

Descriptors: *Clear-cutting, *Erosion, *Water quality, *Nutrients, *Montana, Streams, Sediment transport, Precipitation (Atmospheric), Overland flow, Runoff, Water pollution sources, Vegetation, Soil types.
Identifiers: *Ground cover effects.

Sixty-five study units, from 10 to 58 acres in size, in the larch and Douglas-fir forest type of western Montana were clearcut and the logging debris broadcast burned between 1967 and 1970. Multidisciplinary research on these units included the effects of these treatments on soil stability and runoff. Overland flow and sediment were caught in tanks below 24 runoff plots. Logging and burning temporarily impaired watershed protection and increased overland flow and erosion of soils that are derived from Belt series rocks and occur on gentle to steep slopes. However, vegetal recovery returned conditions to near prelogging status within 4 years. The small increase in plant nutrient losses, which occurred in the sediment and the overland flow during the denuded period, represented only a small fraction of the available nutrients on these sites. Usually, nutrient losses from treated plots exceed those from control plots. In 4 years, 60 pounds of filtrable (dissolved) solids per acre were lost in the runoff from the logged and burned plots on Miller Creek. This is twice that from the controls. Among the nutrient elements, potassium and sodium losses were especially great in the dissolved form when compared to their relative ranking in the sediment. (See also W73-03536) (Woodard-USGS)
W73-03549

LOGGING AND WATER QUALITY IN THE PACIFIC NORTHWEST,
Oregon State Univ., Corvallis. School of Forestry.
G. W. Brown.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 330-334, 1972. 1 fig, 10 ref.

Descriptors: *Lumbering, *Road construction, *Water pollution sources, *Sediment transport, *Pacific Northwest U.S., Clear-cutting, Forest watersheds, Overland flow, Streamflow, Water quality, Water temperature, Environmental effects, Erosion control, Watershed management, Oregon, Reviews.
Identifiers: *Ground cover effects.

The impact of logging and road construction on water quality in the steep, densely forested watersheds of the Pacific Northwest is summarized. The forests of the Pacific Northwest are among the most productive in the world. In Oregon, some 536 billion board feet of standing sawtimber annually supply 9.1 billion board feet to national and international markets. In the past, management of the area's forested watersheds has focused primarily upon the production of timber. Many of the streams in these watersheds are also the spawning and rearing sites for a valuable anadromous fishery and, in many instances, the source of water for Northwest municipalities. Management of these watersheds is in a state of transition. Recent research findings have shown that clearcut logging can significantly affect stream temperature, and sediment and dissolved oxygen concentration. Water quality standards prescribed for interstate waters are being extended to small, forested streams. Oregon, for example, is now in the process of instituting a new forest practices act which will prescribe logging practices and standards of operation and enforcement to meet these water quality criteria. (See also W73-03536) (Woodard-USGS)
W73-03551

THE INFLUENCE OF PERCENTAGE FOREST ON DESIGN FLOODS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
B. M. Reich.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings series, No 14, p 335-340, 1972. 7 fig, 11 ref.

Descriptors: *Runoff, *Streamflow, *Forest watersheds, *Lumbering, *Design flood, Water yield, Environmental effects, Flow characteristics, Peak discharge, Reviews, Regression analysis, Appalachian Mountain region, Correlation analysis, Slopes, Vegetation, Soil properties, Arizona.
Identifiers: *Ground cover effects.

A review is made of regression studies that have been performed on forest watersheds in search of design equations for the mean of the annual flood series; the volume of runoff from individual floods; the peak discharge of individual flood

hydrographs; and recession for triangular flood hydrographs. Emphasis is placed on forest influences. Mean annual floods from various size watersheds follow a log-log relationship with watershed area if they are derived from adjacent watersheds in the same lithological region and climate. Increased percentages of wooded area reduce 2.33-year floods in many parts of Pennsylvania. Clearing of forest in the high country of Arizona increases the 2.33-year floods. Percentage of wooded area is a more important deterministic influence than many geomorphic parameters when developing regional flood prediction equations. (See also W73-03536) (Woodard-USGS)
W73-03552

THE ROLE OF HYDROLOGIC PROPERTIES OF THE FOREST FLOOR IN WATERSHED HYDROLOGY,
British Columbia Univ., Vancouver. Dept. of Soil Science.
P. A. Plamondon, T. A. Black, and B. C. Goodell.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois American Water Resources Association Proceedings Series, No 14, p 341-348, 1972. 10 fig, 1 tab, 13 ref.

Descriptors: *Hydrologic properties, *Forest watershed, *Forest soils, *Hydrology, *Water balance, Mathematical studies, Hydrologic data, Precipitation (Atmospheric), Hydraulic conductivity, Absorption, Runoff, Vegetation, Topography, Slopes, Analytical techniques.
Identifiers: *Ground cover effects.

The role of the forest floor in watershed hydrology was investigated by measuring the components of its water balance on a 30 deg slope and by determining its water retention and hydraulic conductivity characteristics in the laboratory. The hydraulic conductivity varied by about four orders of magnitude over a range of matric potentials between -0.003 and -0.08 bars. When the forest floor had reached its maximum water content during rainfall, the drainage rate through the matrix accounted for approximately 0.5% of the rainfall rate. The amount of water absorbed during rainfall was largely a function of the initial water content and hydraulic conductivity of the forest floor. It appears that the forest floor contributes to delayed stormflow, stores a significant amount of available water for plants, and does not significantly contribute to base flow or affect streamflow peaks. (See also W73-03536) (Woodard-USGS)
W73-03553

STRIP-MINING INCREASES FLOOD POTENTIAL OF MOUNTAIN WATERSHEDS,
Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station.
W. R. Curtis.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 357-360, 1972. 4 fig, 5 ref.

Descriptors: *Strip mines, *Coal mines, *Runoff, *Streamflow, *Kentucky, Appalachian Mountain region, Mining, Rainfall-runoff relationships, Flow rates, Peak discharge, Hydrologic data, Data collections, Vegetation, Slopes, Topography.
Identifiers: Flood potential, Runoff increase.

A study in eastern Kentucky indicated that surface mining for coal alters the natural processes and affects the water resources in small Appalachian watersheds. Peak flow rates increased by a factor of 3 to 5 after surface mining. Lag time was reduced, thus effecting an increase in the rate at which flood peaks move downstream. It appears that peak flow is directly and positively correlated with the percent of area disturbed surface mining. The watersheds range in size from 172 to 380 acres. Valleys are at about 800 feet elevation and ridge tops at 1,500 feet. Three minable coal beds outcrop at approximate elevations of 1,350, 1,380, and 1,420 feet. (See also W73-03536) (Woodard-USGS)
W73-03554

DEEP SEEPAGE MANAGEMENT ON HEADWATER KARST WATERSHEDS,
Missouri Univ., Columbia. School of Forestry.
C. D. Settergren, and D. L. Boehm.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 361-364, 1972. 4 fig, 2 ref.

Descriptors: *Water balance, *Karst hydrology, *Watersheds (Basins), *Runoff, *Missouri, Hydrologic budget, Headwaters, Rainfall-runoff relationships, Data collections, *Seepage, Overland flow, Water yield, Streamflow, Land use, Vegetation, Reviews.
Identifiers: Deep seepage management, *Karst watersheds.

The runoff regime can be beneficially influenced by vegetative cover manipulation. In karst areas the local water balance is extremely complex and the potential for controlling hydrologic response to headwater management takes on a new meaning. Moreover, deep seepage from small headwater watersheds, although a loss from a local water yield standpoint, is important as a source for many of the regions larger streams. In order to better understand the magnitude and seasonal timing of the deep seepage process, a water balance study was conducted during 1969 on a small 12-acre karst watershed in southeast Missouri. With an annual total precipitation of 37.48 inches, the cumulative deep seepage losses and experimental error were calculated to be 8.14 inches, or 22% of the annual budget. Although some losses occurred throughout the entire year in response to periodic high precipitation and increased storage, the greatest contributions to deep seepage come between the first part of October and the end of February. (See also W73-03536) (Woodard-USGS)
W73-03555

WATERSHEDS IN THE RURAL-URBAN FRINGE,
Indiana Univ., Bloomington. Dept. of Geography.
M. C. Roberts.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 388-393, 1972. 5 fig, 10 ref.

Descriptors: *Urbanization, *Rural areas, *Environmental effects, *Runoff, *Indiana, Water yield, Urban hydrology, Farms, Watersheds (Basins), Urban runoff, Construction, Storm runoff, Urban drainage, Land use, Geomorphology, Floods, Overland flow, Streamflow, Correlation analysis, Reviews.
Identifiers: *Bloomington area (Ind), *Rural-urban fringe.

The impact of urbanization on rural watersheds is discussed with the aid of specific examples from the Jackson Creek watershed near Bloomington, Indiana. The expansion of nonfarm land use was mapped over a 32-year time period in the Jackson Creek basin. The spatial pattern is an aymmetric one reflecting the concentration of new development on the sest side of the watershed. This pattern is a response to the city policy of sewers and waterlines being provided to areas immediately adjacent to previous developments. A sampling of land-use intensity indicates that since 1939 there has been a drop in the amount of impermeable surface in residential areas from 34% to 15% (the newer subdivisions are being developed with larger lot sizes). However, extensive commercial developments, having 100% impermeability, have been built as well. Newly constructed urban areas often produce so much extra runoff that the land downstream is periodically inundated. The costs are carried by the people who did not initiate the cause for them. Planners should be able to predict such outcomes of modifying the environment. (See also W73-03536) (Woodard-USGS)
W73-03556

CHANGING WATERSHEDS IN METROPOLITAN AREAS: A STATISTICAL ANALYTIS OF SELECTED BASINS IN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Geography.
R. M. Hordon.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 394-399, 1972. 4 fig, 3 tab, 20 ref. OWRR C-1629 (No 3147) (2).

Descriptors: *Water quality, *Water pollution sources, *Urbanization, *New Jersey, *Statistical methods, Regression analysis, Water temperature, Hydrogen ion concentration, Dissolved oxygen, Biochemical oxygen demand, Color, Alkalinity, Bacteria, Streamflow, Flow rates, Correlation analysis, Watersheds (Basins).
Identifiers: Water quality changes.

Some of the best water quality data sets available in New Jersey are routinely collected by large water supply agencies. Several such sets, consisting of nine variables (temperature, pH, DO, BOD, color, alkalinity, bacteria, discharge, and percent saturation) were available in the files of the Elizabethtown Water Company, the Passaic Valley Water Commission, and the Hackensack Water Company. The data for five sites in the three major basins of northeastern New Jersey - the Raritan, Passaic, and Hackensack - were grouped in calender year sets: 1970-62 and 1967-69. Factor analysis using the Varimax rotation resulted in three factors: (1) an oxygen-related factor (high inverse loadings on temperature and DO), (2) and appearance factor (discharge and color, and (3) a third variable factor occasionally loading on percent saturation. Intrabasin and interbasin factor structures were quantitatively compared by a statistical technique called RELATE which enables one to indicate the degree of similarity between factor structures by obtaining the cosine of the angle between component vectors. These cosine values may then be interpreted as correlation coefficients. (See also W73-03536) (Woodard-USGS)
W73-03557

USE OF STORM DRAINAGE MODELS IN URBAN PLANNING.
Water Resources Engineers, Inc., Walnut Creek, Calif.
L. A. Roesner, D. F. Kibler, and J. R. Monser.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 400-405, 1972. 6 fig, 10 ref.

Descriptors: *Urban hydrology, *Storm drains, *Land use, *Water quality, *Water yield, Model studies, Methodology, Urbanization, Parks, Buildings, Urban drainage, Storm runoff, Watersheds (Basins), Urban runoff, Water pollution sources.
Identifiers: *San Francisco (Calif), Selby Street drainage basin, Water quality changes, Runoff changes.

The use of storm drainage models is demonstrated for evaluating the effect of land use changes on the

quantity and quality of urban runoff. The demonstration is made by application of the models to the Selby Street drainage basin in the city of San Francisco. Comparisons are made between the quantity and quality of urban runoff under present land-use conditions and a modified land-use condition in which a 305-acre park is assumed to be multiple residential housing. The simulation results show that the changed land use has a significant effect on the combined sewer overflows from the system. The suspended-solids concentrations for the multiple residential land use case are higher than for the park, and the peak concentration is lagged. The increased concentration is due to the increased washoff of surface pollutants as the result of the increased runoff. The reason for the lag in the peak concentrations is not apparent. (See also W73-03536) (Woodard-USGS)
W73-03558

LOW FLOWS AND TEMPERATURES OF STREAMS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
F. T. Hidaka.
Geological Survey Basic-data Contribution 1, Open-file Report, 1972. 11 p, 1 map, 3 tab, 12 ref.

Descriptors: *Streamflow, *Low flow, *Water temperature, *Washington, *Hydrologic data, Data collections, Water resources development, Watershed management, Water supply, Water utilization, Flow rates, Stream gages, Planning, Urbanization.
Identifiers: *Seattle-Tacoma Area (Wash).

Low-flow data for streams in the Seattle-Tacoma, Washington, area are accompanied by information on seasonal variations in water temperatures at sites selected as representing regional stream-temperature patterns. Because low flows and high water temperatures commonly occur together, constraints may be imposed on various uses of the region's streams. The average annual runoff of streams in the Seattle-Tacoma region is 13,000 mgd discharging to Puget Sound. Because of annual seasonal variations, streamflow decreases to less than one-fifth this amount--2,300 mgd--during the late summer and early fall. This seasonal decrease in streamflow is an important factor in water-resources planning and development; the minimum flow represents the dependable amount of water available without storage. (Woodard-USGS)
W73-03739

4D. Watershed Protection

HYDROLOGIC INVESTIGATIONS OF SMALL WATERSHEDS IN OHIO: PHASE II. 1969-1972,
Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 02A.
W73-03277

SCHWENGEL--A SOIL CONSERVATION LEADER,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03312

RURAL DEVELOPMENT ACT OF 1972--LEGISLATIVE HISTORY.
For primary bibliographic entry see Field 06E.
W73-03348

CARBON HILL WATERSHED, CUSTER COUNTY, MONTANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
Available from the National Technical Information Service as EIS-MT-72-4862-F, $4.25 in paper copy, $0.95 in microfiche. March 1972. 45 p, 1 map, 1 tab.

Descriptors: *Montana, *Environmental effects, *Watershed management, *Multiple-purpose projects, Flood protection, Drainage systems, Reservoirs, Floodways, Dams, Construction, Reservoir construction, Recreation facilities, Flood control, Sediment control, Water pollution control, Water quality control, Land management, Land use, Water table, Water control, Water management (Applied).
Identifiers: *Environmental Impact Statements, *Carbon Hill Watershed (Mont).

This watershed project consists of conservation land treatment measures, four reservoirs, an open channel floodway, a closed floodway and drainage system and recreational facilities. The watershed contains about 5,950 acres in Custer County, Montana. Favorable environmental effects include a reduction of floodwater and sediment damages to 840 acres of agricultural and urban land, reduction of pollutants and sediment being transported to urban areas and the Yellowstone River, elimination of mosquito breeding places, increase in recreation facilities, additional water surface for waterfowl resting area and reduced soil salinity. Adverse environmental effects include the commitment of 287 acres of land for dams, reservoirs, floodways and recreation facilities and the temporary inundation of up to 2.5 miles of normally dry gullies. Alternatives considered included conservation land treatment measures alone, floodproofing, land purchase, flood plain zoning, flood plain insurance, and other combinations of structural measures. Included are comments from interested sources. (Brackins-Florida)
W73-03352

WATERSHEDS IN TRANSITION.
For primary bibliographic entry see Field 04C.
W73-03536

PLANT NUTRIENT AND SOIL LOSSES IN OVERLAND FLOW FROM BURNED FOREST CLEARCUTS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04C.
W73-03549

BAL HARBOUR, FLORIDA, PARTIAL BEACH RESTORATION, BEACH EROSION CONTROL AND HURRICANE PROTECTION PROJECT, DADE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 08D.
W73-03565

WATERSHED DEVELOPMENT PLANS--1969.
For primary bibliographic entry see Field 06B.
W73-03590

SHORELINE PROTECTION.
For primary bibliographic entry see Field 08D.
W73-03592

SABINE RIVER BASIN COMPREHENSIVE STUDY.
For primary bibliographic entry see Field 06B.
W73-03593

NATURE AS A POLLUTER,
House, Washington, D.C.
F. Schwengel.
Congressional Record, Vol 118, p E6471 (daily ed.) June 25, 1972. 1 p.

Descriptors: *Watershed management, *Legislation, *Federal government, *Eronsion control, Sheet erosion, Washouts, Flood damage, Water control, Governmental interrelations, Interagency cooperation, Erosion, Bank erosion, Sediment yield, Stream stabilization, Watershed protection, Watersheds (Basins), Soil management, Surface runoff, Water management (Applied), Flood control.

To control the effects of erosion, an effective watershed program is proposed that will authorize the Secretary of Agviculture to make binding agreements for up to 10 years with people at all levels of the program with specific requirements to insure that the needed steps are taken to make the program work. Present and proposed legislation aimed at controlling point source pollution such as sewers and industrial discharges will handle only 7 per cent of the total pollution problem. However, non-point pollution, particularly erosion, causes 700 times as much pollution as all U.S. sewers and is at the heart of our total pollution problem. Streams that drain our lands have always carried sizable quantities of sediment. These sediments are derived from erosion of upland areas, and from cyclic erosion in gullies and drainage channels. Special erosion problems such as landslides, flood scour and sheet erosion, while occurring at irregular intervals also cause permanent damage to our environment. (Beardsley-Florida)
W73-03602

NONPOINT SOURCE POLLUTION FROM AGRICULTURAL, RURAL AND DEVELOPING AREAS,
House, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-03603

CONTRIBUTION TO STUDY OF BUFFER STRIP CROPPING METHOD TO CONTROL WATER EROSION IN WEST AFRICA: EXPERIMENTAL RESULTS AND OBSERVATIONS ON THE FIELD (IN FRENCH),
E. J. Roose, and R. Bertrand.
Agron Trop Ser Agron Gen Etud Tech, Vol 26, No 11, p 1270-1283, 1971, Illus, English summary.
Identifiers: Africa, Arboriculture, Buffers, Conservation, *Erosion control, Cropping, Erosion, Horticulture, Methods, Soil conservation, Strip, *Water conservation.

The effectiveness of buffer strip cropping for soil and water conservvation was measured on runoff plots in 3 ecological research stations of West Africa: Abidjan Bouake and Allokoto (Niger). Where grass grows abundantly as soon as the rainy season begins, permanent grass strips of 2 or 4 m wide are very effective; they absorb a good portion of runoff water and induce sedimentation of eroded material so much that they modify the landscape in a succession of steps. Application of this soil conservation system was analyzed for field in the Ivory Coast. It was successful in research stations, for arboriculture, horticulture and for mechanized cultivation by well supervised farmers.--Copyright 1972, Biological Abstracts, Inc.
W73-03813

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

BIOLOGY AND CHEMISTRY OF SURFACE FRESHWATER MICROLAYERS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
B. C. Parker.

Available from the National Technical Information Service as PB-213 809, $3.00 in paper copy, $0.95 in microfiche. Completion Report, (1972). 19 p, 8 tab, 4 ref. OWRR A-037-VA (5).

Descriptors: Microbiology, Algae, Fungi, Bacteria, Coliforms, Seston, *Sampling, *Monitoring, *Pollutant identification.
Identifiers: *Microlayers, Surface slicks.

Over a period of two years the efficiency of three samplers has been tested for the collection of surface freshwater microlayers. Two samplers, the Surface Sampling drum (SSD) and Surface Sampling Screen (SSS) are based upon designs previously employed for studying sea surface microlayers, and the third sampler, called the Surface Sampling Tray (SST) is of original design. Laboratory calibration data reveal that the SSD collects the thinnest microlayers (less than 52 micros) and enables more repeatable results; the SSS is next in order of efficiency, sampling a mean microlayer thickness of more than 300 microns; and the SST is least efficient, sampling a mean microlayer thickness of more than 600 microns. Data from several freshwater ecosystems during all seasons reveal that surface microlayers frequently differ from submicrolayer water in their inorganic chemistry (especially higher ammonium, phosphate, and perhaps certain heavy metal concentrations) and in their microbiology. Microbiologically the data reveal that sometimes order of magnitude differences in numbers of algae, fungi, and bacteria occur in microlayers relative to submicrolayer water. The data often are similar for coliform bacteria, testifying that microlayers may be useful for increasing the detection capability for various pollutants. Some improvements in pollution monitoring may well result from these studies, as already suggested by the data on coliform bacteria.
W73-03272

BIOLOGICAL AND CHEMICAL STUDY OF VIRGINIA'S ESTUARIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 02L.
W73-03273

THE ISOTOPIC COMPOSITION OF OXYGEN AND HYDROGEN IN SOME BRINES FROM THE MESOZOIC IN NORTH-WEST POLAND,
Instytut Balneoklimatyczny, Poznan (Poland).
For primary bibliographic entry see Field 02K.
W73-03285

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 12-16. NORTH PACIFIC SLOPE BASINS, ALASKA, AND HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-03293

ISOLATION OF HUMIC SUBSTANCES FROM SWAMP WATERS,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
A. V. Fotiev.
Available from NTIS Springfield, Va 22151. TT69-55032. Price $3.00 paper copy. In: Production and circulation of organic matter in inland waters; TT69-55032, Israel Program for Scientific Translations, Jerusalem, p 32-35, 1969. 8 ref. (Originally published as Trudy Instituta Biologii Vnutrennikh Vod, No 13 (16); Izdatel'stvo 'Nauka', Moscow, 1966.)

Descriptors: *Water chemistry, *Organic matter, *Humus, *Swamps, *Inland waterways, Rivers, Reservoirs, Water sampling, Oxidation, Colloids, Humic acids, Fulvic acids, Freezing, Analytical techniques.
Identifiers: *USSR.

Water samples were collected in November 1962 from small rivers flowing into the Rybinsk Reservoir in north-central Soviet Russia for isolation of humic substances from swamp water by freezing. The soluble part of isolated humus in water is a reversible colloid (fulvic acids), and the insoluble part is an irreversible colloid (humic acids). Isolated organic matter is a mixture of humic and primarily fulvic acids. Permanganate oxidation values for humus isolated from swamp water are similar to those for organic matter in waters of the White Sea. (Josefson-USGS)
W73-03297

INFLUENCE OF HYDRAULIC STRUCTURES ON THE OXYGEN CONTENT IN THE WATERS OF THE VOLGA IN WINTER,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
A. V. Fotiev.
Available from NTIS Springfield, Va 22151 as TT69-55032. Price $3.00 paper copy. In: Production and circulation of organic matter in inland waters; TT69-55032, Israel Program for Scientific Translations, Jerusalem, p 36-39, 1969. 3 tab, 5 ref. (Originally published as Trudy Instituta Biologii Vnutrennikh Vod, No 13 (16); Izdatel'stvo 'Nauka', Moscow, 1966.)

Descriptors: *Water chemistry, *Dissolved oxygen, *Inland waterways, *Hydraulic structures, Hydraulic turbines, Hydroelectric plants, Reservoirs, Dams, Tailwater, Aeration, Gases, Water analysis, Water sampling, Winter.
Identifiers: *USSR, *Volga River.

Hydrochemical investigations were carried out in March of 1961 and 1962 and in the winter of 1963 to study the influence of hydraulic structures on the concentration of dissolved oxygen in the tailwater channel of the Uglich Hydroelectric Power Station on the Volga. The amount of dissolved oxygen in tailwaters of the station after the passage of water through turbines differs little from that above the dam. In comparatively cold winters the concentration of dissolved oxygen in the reservoir and in the Volga River and its tributaries reaches critical values for fish hibernation at the end of winter. (Josefson-USGS)
W73-03298

BIOCHEMICAL UPTAKE OF OXYGEN IN RESERVOIRS,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
A. A. Bylinkina.
Available from NTIS Springfield, Va 22151 as TT69-55032. Price $3.00 paper copyz In: Production and circulation of organic matter in inland waters; TT69-55032, Israel Program for Scientific Translations, Jerusalem, p 40-44, 1969. 5 ref. (Originally published as Trudy Instituta Biologii Vnutrennikh Vod, No 13 (16); Izdatel'stvo 'Nauka', Moscow, 1966.)

Descriptors: *Water chemistry, *Biochemistry, *Biochemical oxygen demand, *Oxygen, *Reservoirs, Inland waterwyts, Oxidation, Organic matter, Temperature, Plankton, Crustaceans, Microorganisms, Water sampling, Water analysis, Analtyical techniques, Winter.
Identifiers: *USSR.

Experiments were conducted at the Klyaz'ma Reservoir near the village of Ostashkovo in Moscow Oblast to study biochemical uptake of oxygen in reservoirs during winter. The content of oxygen in isolated plankton-free water samples was compared with that in waters of the reservoir to evaluate the role of various factors involved in oxygen uptake, including biochemical oxidation of dissolved organic matter, oxidation of decomposition products of bottom deposits, and respiration of plankton organisms. Oxygen uptake resulting from bacterial oxidation of organic matter accounted for 80% of the total decrease in the amount of oxygen observed in the surface layer of the reservoir. Oxygen uptake by Daphnia longispina and Diaptomus graciloides at temperatures of 0 deg C was similar to the oxygen uptake by these organisms at 2 deg C. A sharp drop in total oxygen uptake over this temperature range was not reflected in the oxygen consumption by crustaceans. (Josefson-USGS)
W73-03299

HYDROCHEMICAL DATA ON THE SANITARY STATE OF THE UPPER VOLGA,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
N. A. Trifonova.
Available from NTIS Springfield, Va 22151 as TT69-55032. Price $3.00 paper copy. In: Production and circulation of organic matter in inland waters; TT69-55032, Israel Program for Scientific Translations, Jerusalem, p 50-61, 1969. 1 fig, 5 tab, 6 ref. (Originally published as Trudy Instituta Biologii Vnutrennikh Vod, No 13 (16); Izdatel'stvo 'Nauka', Moscow, 1966.)

Descriptors: *Water chemistry, *Water quality, *Water analysis, *Chemical analysis, *Rivers, Inland waterways, Water sampling, Water properties, Water pollution, Water pollution effects, Waste water (Pollution), Wastes, Nitrogen, Ammonia, Salts, Sulfates, Chlorides.
Identifiers: *USSR, *Volga River, Ammonium nitrogen.

To determine river-water quality, hydrochemical investigations were carried out in upper reaches of the Volga River between Kalinin and Yaroslavl' in September 1959 and October 1962. A comparison of the results with data obtained in the early and mid 1930's reveals that during the past 26-29 years there has been an increase in the ammonium nitrogen content of the Upper Volga and an increase in the oxidation potential, color index, and sulfate concentration between Kalinin and Dubna. Greater concentrations of these constituents have resulted in increased contamination of the Upper Volga despite a higher rate of dilution of reservoir wastes. Contamination of the Volga is also evident from the high concentrations of suspended matter and petroleum waste products in downstream reaches and from the high concentration of ammonium nitrogen (up to 6 mg/liter) below Kalinin in 1959. (Josefson-USGS)
W73-03300

USE OF THE 'OPTICAL INDEX' FOR DETERMINING THE WATER COLOR OF RESERVOIRS,
Akademiya Nauk SSR, Moscow. Institut Biologii Vnutrennykh Vod.
M. G. Ershova.
Available from NTIS Springfield, Va 22151 as TT69-55032. Price $3.00 paper copy. In: Production and circulation of organic matter in inland waters; TT69-55032, Israel Program for Scientific Translations, Jerusalem, p 62-69, 1969. 4 fig, 1 tab, 19 ref. (Originally published as Trudy Instituta Biologii Vnutrennikh Vod, No 13 (16); Izdatel'stvo 'Nauka', Moscow, 1966.)

Descriptors: *Water properties, *Optical properties, *Color, *Reservoirs, *Inland waterways, Organic matter, Turbidity, Density, Water quality, Water sampling, Water analysis, Analytical techniques, Colorimetry, Equations.
Identifiers: *USSR.

The optical index of color in water samples collected from the Cherepovets Reservoir in Vologda Oblast in July 1964 was determined by measurement of optical density at 360 and 620 millimicrons in the FEKN-57 photoelectric colorimeter-nephelometer and by subsequent calculation by equation. At water-color values below 70 deg, the

reliability of the color index and the optical index is the same. In more highly colored waters a determination of color by the optical index is more reliable than a colorimetric determination of the color index. Ten-day storage of water samples reveals a decrease in optical index values, which are 10% lower than corresponding initial values. (Josefson-USGS)
W73-03301

STUDY OF ORGANIC MATTER IN NATURAL WATERS BY MEANS OF LUMINESCENCE,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
V. E. Sinel'nikov.
Available from NTIS Springfield, Va 22151 as TT69-55032. Price $3.00 paper copy. In: Production and circulation of organic matter in inland waters; TT69-55032, Israel Program for Scientific Translations, Jerusalem, p 74-81, 1969. 2 fig, 1 tab, 12 ref. (Originally published as Trudy Instituta Biologii Vnutrennikh Vod, No 13 (16); Izdatel'stvo 'Nauka', Moscow, 1966).

Descriptors: *Organic matter, *Light, *Light intensity, *Optical properties, *Naturel streams, Inland waterways, Reservoirs, Color, Organic compounds, Fulvic acids, Humic acids, Hydrobiology, Algae, Water sampling, Water pollution, Analytical techniques, Fluorescence.
Identifiers: *USSR, *Luminescence, *Natural waters.

Luminescence of colored organic matter in water samples collected from the Rybinsk Reservoir at Koprino in Yaroslavl' Oblast was investigated. A relation was established between color of natural waters and intensity of their luminescence. The relation between luminescence intensity and color index is modified by the biological processes of the water body and by algal development. Fulvic acids of soil origin contribute significantly to the green color of water in the Volga and Sbrosnoi reaches of the reservoir. (Josefson-USGS)
W73-03302

LUMINESCENCE SPECTRA OF CERTAIN INLAND WATEUS,
Akademiya Nauk SSSR, Mosocow. Institut Biologii Vnutrennykh Vod.
V. E. Sinel'nikov, and B. D. Ryzhikov.
Available from NTIS Springfield, Va 22151 as TT69-55032. Price $3.00 paper copy. In: Production and circulation of organic matter in inland waters; TT69-55032, Israel Program for Scientific Translations, Jerusalem, p 82-86, 1969. 4 fig, 1 tab, 4 ref. (Originally published as Trudy Instituta Biologii Vnutrennikh Vod, No 13 (16); Izdatel'stvo 'Nauka', Moscow, 1966.)

Descriptors: *Light, *Light intensity, *Color, *Inland waterways, Rivers, Reservoirs, Organic matter, Organic compounds, Water analysis, Water sampling, Analytical techniques.
Identifiers: USSR, *Luminescence, *Luminescence spectra.

Water samples were collected from the Upper Volga between Dubna and the Rybinsk Reservoir and from the Moskva and Oka Rivers to Ryazan for investigation of luminescence spectra of inland waters. A total of 50 water samples taken from the surface layer and at a depth of 0.6 m were analyzed. The luminescent organic substances were partially extracted immediately with chloroform. Luminescence spectra reflect the changes occurring in waters of reservoirs and can be used in color determinations. (Josefson-USGS)
W73-03303

METHOD OF PREPARING DRY RESIDUE FROM WATER WITH A LOW MINERAL CONTENT FOR SPECTRAL ANALYSIS,
Akademiya Nauk SSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 02K.
W73-03304

REDIOCHROMATOGRAPHIC ASSAY FOR THIOL GROUPS OF SOLUBLE PROTEINS USING MERCURY-203 LABELED METHYLMERCURY,
Seton Hall Univ., South Orange, N.J.
M. C. Cullen, and E. T. McGuinness.
Anal Biochem. Vol 42, No 2, p 455-469, 1971. Illus.
Identifiers: Albumin, Assay, Bovine, Chromatography, Environmental effects, *Mercury, Mercury-203, Methyl-mercury, *Proteins, Radiochemical analysis, Serum, *Thiol groups.

It was demonstrated for the first time that 203Hg (II), (203Hg)CH3Hg+, and (203Hg)methyl-mercury-labeled proteins can be continously monitored by the nondestructive readout of a column chromatographic effluent directed through an anthracene packed flow-cell detector mounted in a liquid scintillation counter. Retention of mercury or methylmercury and methylmercury-labeled proteins on anthracene is abolished or markedly attenuated in the presence of the cationic surfactant, Hyamine 2389. Thiol and disulfide group assays are described for bovine serum albumin and Rnase under a variety of experimental conditions. Between 10-6 and 10-9 mole of protein was rapidly and reproducibility assayed when the specific activity of the mercurial solution was held between 13 and 35 micro Ci/mmole. In view of the ramifications of mercury and methylmercury poisoning, the automated assay of radiomercury and mercurials described is sufficiently sensitive to provide the basis for a radiochemical determination of Hg (II) and CH3Hg+ in environmental water.--Copyright 1972, Biological Abstracts, Inc.
W73-03337

CHEMICAL OXYGEN DEMAND WATER ANALYZER,
Rederi A.B. Nordstjernan, Nynashamm (Sweden).
P. H. Jonsson.
U.S. Patent No 3,674,370, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 900, No 1, p 202, July 4, 1972.

Descriptors: *Patents, *Oxygen, *Chemical oxygen demand, *Water analysis, *Instrumentation, Equipment, Abatement, Pollution abatement, Water quality, Water quality control, Water pollution, Water pollution control, *Measurement.
Identifiers: Water analyzers, Analyzers.

A water sample is treated with a dichromate in acid solution and the amount of trivalent chromium formed is determined. The equipment consists of a combined reaction and measuring vessel which has a heater to heat the reaction mixture and a spectrophotometer to determine the concentration of trivalent chromium formed. (Sinha-OEIS)
W73-03388

HYDROGEOCHEMISTRY OF THE SURFACE WATERS OF THE MACKENZIE RIVER DRAINAGE BASIN, CANADA--III. STABLE ISOTOPES OF OXYGEN, CARBON AND SULPHUR,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 02K.
W73-03410

HYDROGEOCHEMISTRY OF THE SURFACE WATERS OF THE MACKENZIE RIVER DRAINAGE BASIN, CANADA --IV. BORON--SALINITY-CLAY MINERALOGY RELATIONSHIPS IN MODERN DELTAS,
Calgary Univ. (Alberta). Dept. of Geology.
For primary bibliographic entry see Field 02K.
W73-03411

PALEOTEMPERATURES AND OTHER HYDROLOGICAL PARAMETERS DEDUCED FROM NOBLE GASES DISSOLVED IN GROUNDWATERS; JORDAN RIFT VALLEY, ISRAEL,
Israel Atomic Energy Commission, Rehovoth; and Weizmann Inst. of Science, Rehovoth (Israel).
For primary bibliographic entry see Field 02K.
W73-03412

GEOCHEMICAL SURVEY OF WATER,
Geological Survey, Rolla, Mo.
For primary bibliographic entry see Field 02K.
W73-03418

HYDROGRAPHIC DATA FROM OREGON WATERS, 1971,
Oregon State Univ., Corvallis. School of Science; and Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 07C.
W73-03447

AN INVESTIGATION INTO RECREATIONAL WATER QUALITY, WATER QUALITY CRITERIA DATA BOOK, VOL. 4,
Envirogenics Co., El Monte, Calif.
For primary bibliographic entry see Field 05C.
W73-03503

QUANTITATIVE METHODS FOR PRELIMINARY DESIGN OF WATER QUALITY SURVEILLANCE SYSTEMS,
Raytheon Company. Portsmouth, Rhode Island, Environmental Systems Center.
C. V. Beckers, S. G. Chamberlain, and G. P. Grimsrud.
Copy available from GPO Sup Doc as EP1.23/2:72-001, $2.75. Environmental Protection Agency report EPA-R5-72-001, November 1972. 226 p, 21 fig, 13 tab, 50 ref, append. EPA Project 16090 HOJ; Contract 68-01-0144.

Descriptors: *Network design, *Monitoring, *Mathematical models, *Systems analysis, *Data collection, Water quality, Markov processes, River basins, Pollution abatement, Standards, *Ohio, Indiana, Water pollution, Water measurement, Water quality control, Time series analysis, Water quality act, Analytical techniques.
Identifiers: *Wabash River Basin, Wildcat Creek, Surveillance, Ohio River Basin, Space time sampling, Priority measures.

The development and successful demonstration of quantitative design methods for preliminary design of water quality surveillance systems are presented. A comprehensive set of quantitative design procedures are included in handbook form for use within the existing capabilities of governmental water quality agencies. The quantitative methods are intended for use in design of monitoring systems that satisfy an abatement objective. The methods are based on a systems approach, in which the performance of the total surveillance system is evaluated as a whole. A new method for establishing sampling frequency is developed, based on a unique formulation of the sampling design problem. The quantitative preliminary design methods are demonstrated to function satisfactorily on the Wabash River Basin. It is concluded that the methods incorporated in the User Handbook represent an acceptable method for use by governmental water quality agencies under the existing contraints. (EPA abstract)
W73-03507

IDENTIFICATION OF POLYCHLORINATED BIPHENYLS IN THE PRESENCE OF DDT-TYPE COMPOUNDS.
National Environmental Research Center, Cincinnati, Ohio. Analytical Quality Control Lab.

Copy available from GPO Sup Doc as EP1.23/272-004, $1.25; microfiche from NTIS as PB-213 900, $0.95. Environmental Protection Agency report EPA-R2-72-004, October 1972. 62 p, 50 fig, 2 tab, 26 ref, append. EPA Project 16020 GIY.

Descriptors: *Analytical techniques, Chemical analysis, *Fluorescence, *Chlorinated hydrocarbon pesticides, *DDT, Spectroscopy, Spectrophotometry, Organic compounds, Aromatic compounds, Pesticides, Organic pesticides, *Polychlorinated biphenyls, Aroclors, *Luminescence, Pollutant identification.
Identifiers: Low temperature luminescence.

Polychlorinated biphenyls (PCB's) interfere with gas chromatographic analyses of DDT and related compounds, necessitating a simple independent method for PCB determination. The purpose of the present study was to determine the applicability of low temperature (77 deg K) luminescence methods to this problem. Basic studies included documentation of excitation/emission spectra of 6 pesticides (p,p'- and o,p'- DDE, DDD, and DDT), 7 PCB isomers, and 5 PCB mixtures (Aroclors). Although phosphorescence spectra of the DDD and DDT compounds are very similar, possible differences in lifetime and polarization measurements may aid in differentiation. Emission from DDE is at least 100X less intense than that of DDD or DDT, and is therefore more difficult to determine with adequate sensitivity. Spectral differences among various Aroclors are sufficient to allow those studied to be differentiated. Emission from solvent impurities presently limit detection sensitivities to about 1.0 ppm for DDT/DDD and about .01 ppm for Aroclors. By removing interference, detection sensitivities should be improved by two orders of magnitude. Low temperature luminescence studies in various binary mixtures of Aroclor 1254 and p,p'-DDT indicate Aroclor 1254 may be identified and quantitated in the presence of DDT concentrations 100X greater. (EPA abstract)
W73-03515

DATA ACQUISITION FOR WATER QUALITY MANAGEMENT--AN ANALYSIS OF TRADITIONAL GRAB SAMPLING METHODS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 07B.
W73-03538

RADIOACTIVITY OF LAKE MICHIGAN, AUGUST-SEPTEMBER 1970.
Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Radiation Data and Reports, Vol 13, p 559-564, 1972. 1 fig, 4 tab, 1 ref.

Descriptors: *Water pollution, *Lake Michigan, *Radioactivity, *Measurement, Federal government, Interstate commissions, Statistical methods, On-site tests, On-site data collections, Laboratory tests, Chemical analysis, Sediments, Suspended solids, Dissolved solids, Thermocline, Tritium, Strontium, Water pollution sources, Water sampling.

A coordinated four-state-federal radioactivity monitoring program in the Lake Michigan Basin collected water samples at the surface, at mid-depth, and near the lake bottom in unstratified areas. In stratified areas, samples were collected at the surface, just above and below the thermocline and near the bottom. The results are listed in four tables. Table 1 presents the specific latitude-longitude coordinates for sample stations. Table 2 presents the gross alpha and gross beta measurements, tritium levels and solids concentration. Selected samples were composited using equal aliquots for strontium-90 and cesium-137 measurements; Table 3 presents these results. Table 4 presents the radioactivity data associated with the bottom sediments. The data show the levels of radioactivity are very low and, in most cases, are less than the sensitivity of the analytical methods and counting equipment. (Tolle-Florida)
W73-03601

SPEEDS WASTE ANALYSIS,
Beckman Instruments, Inc., Fullerton, Calif.
R. H. Jones.
Food Engineering, Vol 44, No 6, p 107-108, June 1972, 2 fig.

Descriptors: *Organic compounds, *Waste water treatment, *Inorganic compounds, Biochemical oxygen demand, Carbon dioxide, *Analytical techniques, Pollutant identification.
Identifiers: *Organic carbon, Inorganic carbon, Total organic carbon, Infrared analyzer.

Data for waste treatment can be obtained quickly with a total organic carbon (TOC) analyzer whose output generally correlates with the 5-day BOD analysis. When a sample is syringe-injected into the high-temperature column, it is vaporized and organic carbon is catalytically converted to carbon dioxide. At the same time, inorganic carbon is converted to carbon dioxide by thermal decomposition. An infrared analyzer records total carbon on a strip chart recorder. A second, equal size sample is injected into the low-temperature column, in which only inorganic carbon is converted to carbon dioxide. The infrared analyzer then records inorganic carbon. The difference between the first and second readings gives a measure of total organic carbon in the sample. While there is no inherent relationship between TOC and BOD, a good correlation can be established between the two parameters in many waste treatment processes. (Murphy-Texas)
W73-03677

STUDIES ON THE ENUMERATION AND ISOLATION OF OBLIGATE aNAEROBIC BACTERIA FROM DIGESTING SEWAGE SLUDGE,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 05D.
W73-03683

THREE METHODS FOR DETERMINING DISSOLVED OXYGEN CONCENTRATIONS NEAR FISH EMBRYOS (FISHERY SIGNIFICANCE),
New York Cooperative Fishery Unit, Ithaca, N.Y.
For primary bibliographic entry see Field 05B.
W73-03695

METHODS IN AQUATIC MICROBIOLOGY,
G. G. Rodina, T. Suekane, and T. Kinoshita.
University Park Press: Baltimore, Md., Butterworths: London, England. 1972. 461 p. Illus. Pr. $14.50.
Identifiers: *Aquatic microbiology, *Bacteria, Book, Microorganisms, Streptomycetes, *Water analysis, *Analytical techniques.

This book is the English translation of the original Russian work on aquatic microbiology. It was completely updated and reviewed for accuracy. It is a laboratory manual of methods for isolating, culturing, identifying and classifying aquatic microorganisms, with special emphasis on bacteria. Extensive coverage is given to sampling water, sediment or mud for microbiological analyses, special bacterial groups (e.g., sulfur and iron bacteria), techniques for microscopic observation of specimens and culturing various microbial groups. Isolation of pure cultures and quantitative determination of microorganismsin water and sediment are covered. Methods of studying the carbon cycle and microorganisms involved, microorganisms of the nitrogen cycle, the sulfur cycle and transformations of phosphorous compounds by microorganisms are discussed. Isolation of Streptomycetes, submerged slide culture, bacteriological analysis of water in public health, radioactive tracer methods and determination of pH and oxidation-reduction potential are discussed.–Copyright 1972, Biological Abstracts, Inc.
W73-03699

A BRYOPHYTE FLORA OF NORTH SOMERSET,
For primary bibliographic entry see Field 02I.
W73-03718

APPLICATIONS OF THE LOGNORMAL FREQUENCY DISTRIBUTION TO THE CHEMICAL COMPOSITION AND SIZE DISTRIBUTION OF NATURALLY OCCURRING ATMOSPHERIC AEROSOLS,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 02K.
W73-03722

GROUND-WATER CHARACTERISTICS IN A RECHARGE AREA, MAGDALENA MOUNTAINS, SOCORRO COUNTY, NEW MEXICO,
New Mexico Bureau of Mines and Mineral Resources.
For primary bibliographic entry see Field 04B.
W73-03730

PRESERVATION AND STORAGE OF WATER SAMPLES FOR TRACE ELEMENT DETERMINATIONS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
J. L. Clement.
M Sc Thesis, June 1972. 40 p, 16 fig, 4 tab, 20 ref. OWRR A-052-ILL (1).

Descriptors: *Water analysis, *Water sampling, *Preservation, *Trace elements, *Methodology, Refrigeration, Freezing, Storage, Chemical analysis, Copper, Cadmium, Manganese, Zinc.
Identifiers: Sample storage, Sample containers, Sample treatment, Acidification.

Experiments designed to measure the potential contamination associated with currently practiced techniques of preservation and storage of water samples prior to trace element analysis are described and the results compared with published data, where available. The single most effective procedure to eliminate changes in trace element composition of water samples between the time of collection and sample analysis is to store the samples frozen. Freezing eliminates adsorption of trace elements (Cu, Cd, Mn and Zn) on the container surface and permits the complete recovery of the above elements after storage. Acidification (to pH 1) of water samples prior to storage at room temperature reduces the rate of adsorption of the elements examined, but adsorption is not eliminated. Samples must be kept at room temperature for at least several hours at the time of collection and at the time of analysis. Consequently, acidification of water samples at the time of collection is recommended as a precautionary measure to avoid adsorption of trace elements on containers even if the samples are to be stored frozen. Contamination of water samples by polyethylene containers does not appear to be a problem if careful cleaning techniques are employed. (Woodard-USGS)
W73-03733

ORIGIN OF MINERALIZED WATER IN PRECAMBRIAN ROCKS OF THE UPPER PARAIBA BASIN, PARAIBA, BRAZIL,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W73-03741

DISTRIBUTION OF P, K, CA, MG, B, CU, MN, AND ZN IN PEANUT LINES NEAR MATURITY,
Virginia Polytechnic Inst. and State Univ., Holland. Tidewater Research Station.
For primary bibliographic entry see Field 03F.
W73-03781

IDENTIFICATION AND REMOVAL OF SUBSTANCES IMPARTING AN ODOR AND AFFECTING THE TASTE OF RIVER BANK FILTERED GROUND WATER,
Thielemann (H.), Halberstadt (East Germany).
H. Thielemann.
Mikrochim Acta. 1. p 79-80, 1972.
Identifiers: *Water treatment, Activated carbon, Chlorine, Groundwater, Identification, *Odor, Phenols, Rivers, Substances, Taste.

The deteriorating quality of drinking water supplied to the city of Merseberg led to an attempt to identify and try to remove the offending substances. Colorimetric titration with p-nitraniline disclosed the presence of 0.1-0.5 mg total phenol/l, and in the case of 1 well 1.2 mg/l. However, the content of phenols volatilized by steam was only 0.01 mg/l. Treatment with chlorine oxide was ineffective, as was treatment with Wofatit EW; partial success was achieved by using certain activated carbons. A spectroscopic analysis of the adsorbed substances extracted by diethylether disclosed the presence of hydrocarbons, compounds containing carbonyl, methylene- and methyl groups and salts of higher carbonic acids.--Copyright 1972, Biological Abstracts, Inc.
W73-03819

5B. Sources of Pollution

BIOLOGICAL AND CHEMICAL OBSERVATIONS IN MUMFORD AND PALMER COVES (GROTON, CONN.) SEPTEMBER 1970-SEPTEMBER 1971,
Connecticut Univ., Noank. Marine Research Inst.
For primary bibliographic entry see Field 06G.
W73-03262

THERMAL PROBLEMS IN THE SITING OF REINJECTION WELLS,
Oregon State Univ., Corvallis. Dept. of Oceanography.
G. Bodvarsson.
Geothermics, Vol 1, No 2, p 63-66, June 1972. 4 fig, 4 ref. NSF Grant GA-25896.

Descriptors: *Waste disposal wells, *Thermal pollution, *Injection wells, *Hydrogeology, *Path of pollutants, Heat transfer, Geothermal studies, Heat flow, Thermal water.
Identifiers: *Geothermal energy.

Thermal problems are involved in the disposal of flash water from geothermal powerplants by reinjection. The basic equations for the subsurface temperature field in the reinjection zone are derived both for rocks with intergranular and fracture flow. The extent of the thermal contamination by the reinjected water is discussed. In the case of a continuous mass flow of flash water of 1000 kg/sec for a period of 25 years, the contamination may reach out to as much as 5 km or more from the point of re-entry, depending on the type of rock involved. (Knapp-USGS)
W73-03286

HYDROCHEMICAL DATA ON THE SANITARY STATE OF THE UPPER VOLGA,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05A.
W73-03300

RADIOCHROMATOGRAPHIC ASSAY FOR THIOL GROUPS OF SOLUBLE PROTEINS USING MERCURY-203 LABELED METHYLMERCURY,
Seton Hall Univ., South Orange, N.J.
For primary bibliographic entry see Field 05A.
W73-03337

LOSS OF FERTILIZER NUTRIENTS FROM SOILS TO DRAINAGE WATERS,
North Carolina Water Resources Research Inst., Raleigh.
V. J. Kilmer, J. W. Gilliam, R. T. Joyce, and J. F. Lutz.
Available from the National Technical Information Service as PB-213 981, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No 55, August 1972. 25 p, 3 fig, 4 tab, 16 ref. OWRR A-031-NC (1).

Descriptors: *Agricultural runoff, *Agricultural watersheds, *Agricultural chemicals, *Nutrients, *Water pollution, Water quality, *North Carolina, Fertilizers, Nitrogen, Phosphorus.
Identifiers: Tennessee Valley Authority.

The loss of nitrogen and phosphorus to surface and subsurface drainage waters from two very similar watersheds with blue grass sod in Western North Carolina was measured for three years. Only one watershed was fertilized the first two years and both were fertilized the third year. The difference in the quantity of N leaving the two watersheds during the first two years was approximately 10 kg/ha per year or 10 percent of that applied. Most of the nitrogen leaving the two watersheds was in the NO3-N form with the greatest losses coming during the winter months. The total N concentration in water leaving the two watersheds during the winter was 2-3 ppm from the unfertilized watershed and 6-10 ppm from the fertilized watershed. Very little P was lost from either watershed. The NO3-N concentrations found in water samples from 10-foot wells located in the North Carolina Coastal Plain were 1 ppm or less in wooded areas and generally in the range of 1-5 ppm under cultivated fields. The highest concentrations were normally noted during the winter months.
W73-03400

CONTRIBUTION OF FERTILIZERS TO THE POLLUTION OF WATERS IN THE NORTH CAROLINA COASTAL PLAIN,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
R. P. Gambrell, J. W. Gilliam, and S. B. Weed.
North Carolina Water Resources Research Institute Interim report, 1972, 27 p, 9 fig, 15 ref. OWRR B-039-NC (1). 14-31-0001-3622.

Descriptors: *Agricultural runoff, *Water pollution sources, Fertilizers, *Agricultural watersheds, *Agricultural chemicals, *Nutrients, *North Carolina, Water quality, Water pollution.

The fate of fertilizer nitrogen leaching below crop rooting zone at two locations in the North Carolina Coastal Plain was studied. Although representing large acreages under cultivation, the two soils differ considerably in their physical and chemical properties. Porous ceramic cups placed at 1-foot intervals down to the water table were used to obtain soil moisture samples throughout the profile. Samples were analyzed for nitrate and ammonium nitrogen, organic carbon, and chloride. Access tubes were installed to measure reduction-oxidation potentials within the profile. Movement, accumulation, and disappearance of nitrogen were monitored with emphasis on factors affecting the potential for denitrification in these soils. In poorly drained soil of the Tidewater region, nitrogen disappeared rapidly with depth in the profile, particularly within the moisture saturated zone. Redox potentials and soluble organic carbon indicate that denitrification probably is responsible for nitrogen removal. In moderately well drained soil of the Lower Coastal Plain, nitrogen not utilized by the crop may be leaching into surface and subsurface water with excess soil moisture that drains from the profile. Redox and carbon measurements indicate significant loss of nitrogen by denitrification is unlikely in this soil.
W73-03402

MOVEMENT AND DISPERSION OF SOLUBLE POLLUTANTS IN THE NORTHEAST CAPE FEAR ESTUARY, NORTH CAROLINA,
Geological Survey, Washington, D.C.
E. F. Hubbard, and W. G. Stamper.
Available from GPO, Washington, DC 20402 - Price 25 cents (Paper cover). Geological Survey Water-Supply Paper 1873-E, 1972. 31 p, 21 fig, 10 ref.

Descriptors: *Water pollution, *Path of pollutants, *Estuaries, *Dye releases, *North Carolina, Tidal effects, Rhodamine, Tracking techniques, Dye concentrations, Dye dispersion, Data collections, Analytical techniques.
Identifiers: *Northeast Cape Fear Estuary (NC).

Results are presented of a fluorescent-dye-tracing study to determine the concentrations of a pollutant that would be present in the Northeast Cape Fear Estuary (North Carolina) at various rates of continuous waste injection and fresh-water inflow. Rhodamine WT dye was introduced into the estuary at a constant rate over a 24.8-hour period (two tidal cycles) at a point 6.4 miles upstream from the mouth in Wilmington, and concentrations were monitored in the tide-affected part of the river for 17 days. The range between high and low tide averages about 3.5 feet, and there is usually strong flow in both directions. If a pollutant were injected at a rate of 100 pounds per day under relatively low inflow, concentrations would ultimately build up to 20 micrograms of dye per liter of water 1,000 feet downstream. The flushing time is estimated to be 17 days. These results are extrapolated to include periods of lower or higher inflow. For example, at average intervals of 10 years, it is estimated that inflow is so low that 100 days are required for a pollutant to travel the 6.4 miles from the point of waste release to the mouth of the river. Results of a continuous discharge measurement of flow made by current meter during a complete tidal cycle are presented. Net upstream flow in the estuary is possible over a period of several days. (Woodard-USGS)
W73-03406

FLOOD OF OCTOBER 5-10, 1970 IN PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 02E.
W73-03413

SURFACE CURRENT MEASUREMENTS BY EXPENDABLE PROBES,
Coast Guard, Washington, D.C. Applied Sciences Div.
S. Broida, and W. S. Richardson.
Available from NTIS Springfield, Va. 22151 as AD-743 706, Price $3.80 paper copy, 95 cents microfiche. Coast Guard Office of Research and Development Technical Report Project 726520, June 1972. 7 p, 2 fig, 3 ref. Contract DOT-CG-20,859A.

Descriptors: *Path of pollutants, *Remote sensing, *Dye dispersion, *Currents (Water), *Oceans, Tracking techniques, Dye releases, Methodology, Equipment, Aircraft, Ships, Analytical techniques, Water pollution sources.

A method is described for measuring the absolute surface current velocity which is the vectorial sum

of the sea current and the local wind drift velocities. The method uses an expendable probe which can be dropped from aircraft or launched from surface vessels. The accurate measurements obtained can be particularly useful in search and rescue operations as well as in pollution monitoring incidents. An expendable probe is launched and, on contacting the sea surface, a surface marker separates and floats on the surface; this serves simply to mark the location of the measurement. The remainder of the probe is carried to the bottom by its weight and, from its fixed location on the bottom, releases two floats with a predetermined time-delay between them. The floats return to the surface under their own buoyancy. At the surface these parts also emit fluorescein dye which can be photographed or otherwise relatively positioned. (Woodard-USGS)
W73-03417

TEMPERATURE DISTRIBUTION OF THE HEATED EFFLUENT FROM THE NORTHPORT POWER STATION (LONG ISLAND LIGHTING COMPANY),
State Univ., of New York, Stony Brook. Marine Sciences Research Center.
P. K. Weyl.
Technical Report Series No 10, August, 1971. 29 p, 14 fig, 3 ref.

Descriptors: *Powerplants, *Thermal pollution, *Water temperature, *Temperature distribution, Distribution, Heated water, Outlets, *New York.
Identifiers: *Long Island Sound, Lighting companies.

Measurements of temperature distribution in Long Island Sound were taken when only one unit of the Northport Power Station was operating and then with both units operating. The load level of the plant, the state of the tides, the sea state and weather conditions all effect the temperature distribution. Maximum temperature anomalies occur during calm conditions thus the surveys were conducted during three periods of low wind velocity. At a 734 megawatt load an elevation of 6 C above ambient was observed out to 4.5 km from the heated effluent discharge point. Data presented are adequate only for a rough estimate of the temperature distribution. (Ensign-PAI)
W73-03448

DISTRIBUTION OF DISSOLVED OXYGEN IN THE WATERS OF WESTERN LONG ISLAND SOUND,
State Univ., of New York, Stony Brook. Marine Sciences Research Center.
C. D. Hardy, and P. K. Weyl.
Technical Report Series No 11, August 1971. 42 p, 25 fig, 10 ref, 1 append.

Descriptors: *Dissolved oxygen, *Distribution, Oxygen, *Oxygen sag, *Super-saturation, *New York, Photosynthesis, Algae, Mixing, Thermal properties.
Identifiers: *East River (NY), *Long Island Sound.

During the August period of this survey a serious oxygen depletion of D.O. values less than 1.5 ppm occurred in the water column of the upper East River and the Western Long Island Sound bottom waters. Oxygen levels were sustained significantly below minimum water quality standards of federal and state regulatory agencies for tidal waters and estuaries. A large portion of the surface waters of Western Long Island Sound were supersaturated with dissolved oxygen to a 2-3 meter depth. The D.O. supersaturation occasionally exceeded 200% of saturation. This condition was caused by the photosynthetic activity of an intense algal bloom. Vertical mixing was inhibited by the formation of a strong thermal gradient. (Ensign-PAI)
W73-03449

A BIBLIOGRAPHY ON MARINE AND ESTUARINE OIL POLLUTION.
Marine Biological Association of the United Kingdom, Plymouth (England). Library.
For primary bibliographic entry see Field 05G.
W73-03451

ENVIRONMENTAL STUDY OF THE SEWAGE OUTFALL AREA AT SAN CLEMENTE ISLAND AN OPEN-OCEAN SEWAGE DISPOSAL MODEL,
Naval Undersea Research and Development Center, San Diego, Calif.
P. R. Kenis, M. H. Salazar, and J. A. Tritschler.
Available from the National Technical Information Service as AD-745 298, $3.00 in paper copy, $0.95 in microfiche. June 1972. 9 fig, 2 tab, 11 ref, 6 append. ONR Project NR 137-885.

Descriptors: Pacific Ocean, *California, *Outfall sewers, *Sewage disposal, *Model studies, *Forecasting, Ships, Standards, Coliforms, Ecology, Dominant organisms, Mixing, Oxygen demand.
Identifiers: *San Clemente Island, Environmental impact study.

The San Clemente Island sewage discharge site was used as a prediction model for the effects of dumping sewage into the open ocean. Coliform bacterial counts showed the water at distances of several hundred feet from the outfall to be within swimming beach standards. Plant and animal life was altered noticeably only within a 50 ft. range of the outfall with a depletion of some organisms and an abundance of others. Normal ocean mixing was found adequate to prevent oxygen depletion under open-ocean conditions. Odors and floatable materials were minor. The environmental impact study findings were applied to ship discharges in the open seas which predicted results as harmless. (Ensign-PAI)
W73-03452

PYRITIC SYSTEMS: A MATHEMATICAL MODEL,
Ohio State Univ., Research Foundation, Columbus.
A. H. Morth, E. E. Smith, and K. S. Shumate.
Copy available from GPO Sup Doc as EP1.23/2:72-002, $2.25; microfiche from NTIS as PB-213 887, $0.95. Environmental Protection Agency report EPA-R2-72-002, November 1972. 171 p, 30 fig, 44 ref, 5 append. EPA Project 14010 EAH; Contract 14-12-589.

Descriptors: *Mine drainage, *Computer models, *Coal mine wastes, *Pyrite, Pollution abatement, Industrial wastes, *Mathematical models, Model studies.

A mathematical model of an acid mine drainage system has been developed for underground mines. The model relates the rate of acid formation to the rate of pollution discharge from the system. The claculational model was developed using a digital computer to simulate an existing mine as the sum of many micro scale mines, each representing a small reactive volume in the system being modeled. The input to the model is a physical and chemical description of the system. Day-to-day simulation requires data on temperature, rainfall, and oxygen concentration at the exposed coal face. The output of the model is estimates of daily acid load and drainage flow, plus monthly and yearly summaries. The calculational model was based on a carefully described physical model so that a predictive model can be constructed with little or no experimental data. However, methods for constructing the computational model are given which can utilize the field data available to increase the reliability of the model. (EPA abstract)
W73-03506

CHARACTERISTICS OF RAINFALL RUNOFF FROM A BEEF CATTLE FEEDLOT,
Robert S. Kerr Water Research Center, Ada, Okla.
R. D. Kreis, M. R. Scalf, and J. McNabb.
Copy available from GPO Sup Doc as EP 1.23/2: 72-061, $1.00; microfiche from NTIS as PB-213 929, $0.95. Environmental Protection Agency report EPA-R2-72-061, September 1972. 43 p, 11 fig, 7 tab, 26 ref, append. EPA Project 13040 FHP.

Descriptors: Cattle, *Confinement pens, Rainfall-runoff relationships, Pollutants, *Farm wastes, Nutrients, Biochemical oxygen demand, Chemical oxygen demand, Coliforms, Streptococcus, *Feed lots, Path of pollutants, Solid wastes.
Identifiers: *Wastes characteristics, Total organic carbon.

Rainfall runoff from a 12,000-head capacity commercial beef cattle feedlot was characterized and a treatment-disposal system used by the feedlot was evaluated. Fifty percent of the rainfall events produced measurable runoff from the feedpens. A four- to ten-inch manure mantle on the feedpen surface was found to prevent runoff from 0.2- to 0.3-inch rainfalls depending on intensity and antecedent moisture conditions. The total runoff from the feedpens was equivalent to 39 percent of the total rainfall during the study period. Direct runoff from the feedpens contained pollutant concentrations in the form of oxygen demand, solids, and nutrients that were generally an order of magnitude greater than concentrations typical of untreated municipal sewage. Dilution from direct rainfall and a few days of sedimentation in the runoff collection ponds reduced the concentrations of the pollutants up to 90 percent. The total weight of solids and oxygen demanding materials was reduced by about one-half, but the total weight of nutrients was not significantly reduced. The remainder of the treatment disposal system produced no appreciable improvement in the quality of the waste water. Final discharges still contained pollutant concentrations two to three times those of untreated municipal sewage. (EPA abstract)
W73-03520

WATERSHEDS IN TRANSITION.
For primary bibliographic entry see Field 04C.
W73-03536

USING HYDROLOGIC MODELS TO PREDICT THE EFFECTS OF WATERSHED MODIFICATION,
Minnesota Univ., St Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04C.
W73-03539

NUTRIENT LOSS FROM CLEARCUTTINGS IN NEW HAMPSHIRE,
Forest Service (USDA), Durham, N.H.
For primary bibliographic entry see Field 04C.
W73-03548

PLANT NUTRIENT AND SOIL LOSSES IN OVERLAND FLOW FROM BURNED FOREST CLEARCUTS,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 04C.
W73-03549

LOGGING AND WATER QUALITY IN THE PACIFIC NORTHWEST,
Oregon State Univ., Corvallis. School of Forestry.
For primary bibliographic entry see Field 04C.
W73-03551

STRIP-MINING INCREASES FLOOD POTENTIAL OF MOUNTAIN WATERSHEDS,
Forest Service (USDA), Berea, Ky. Northeastern Forest Experiment Station.
For primary bibliographic entry see Field 04C.
W73-03554

CHANGING WATERSHEDS IN METROPOLITAN AREAS: A STATISTICAL ANALYTIS OF SELECTED BASINS IN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Geography.
For primary bibliographic entry see Field 04C.
W73-03557

USE OF STORM DRAINAGE MODELS IN URBAN PLANNING.
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 04C.
W73-03558

NONPOINT SOURCE POLLUTION FROM AGRICULTURAL, RURAL AND DEVELOPING AREAS,
House, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-03603

MERCURY CONTENT OF HUMAN TISSUES DURING THE TWENTIETH CENTURY,
Saratoga General Hospital, Detroit, Mich.
J. Kevorkian, D. P. Cento, J. R. Hyland, W. M. Bagozzi, and E. Hollebeke.
American Journal of Public Health, Vol 62, No 4, p 504-513, April 1972. 3 fig, 2 tab, 16 ref.

Descriptors: *Water quality, *Public health, *Mercury, *Toxins.

The possibility of widespread deadly mercury contamination of the environment as a result of the industrialized way of life looms extremely large through the current public obsession with ecology and pollution. Preserved human autopsy tissues are available for analysis, going back 60 years, in both sexes and matched ages, including the stillborn. Aim of the study was to demonstrate any trend in levels of mercury in humans, up to the present. Various human tissues and organs from 59 autopsy cases covering the period 1913-1970 were analyzed for total mercury content and 10 individual tissue samples for methylmercury levels. Four different qualified laboratories performed the tests on essentially identical tissues samples. Results frequently were widely divergent. However, several coarse but definite trends indicate that total mercury content of most human organs has dropped sharply during the last 60 years, and that such levels have a biphasic curve throughout an individual's lifetime; namely, peaks in early childhood and middle age. The sharp drop may reflect a cleansing of the general environment of mercury and a diminution of any pollution threat. Methylmercury levels ranged from 9 to 74% of total mercury levels, and 2 or 3 brain samples showed no methylmercury at all. These are compared with levels reported for various animals. The data answer some questions, raise many others, and show how little is known about mercury in the human body. (Bean - AWWARF)
W73-03669

BIOLOGY OF WATER POLLUTION: EFFECTS AND CONTROL,
Aston University, Birmingham (England). Dept. of Biological Sciences.
H. A. Hawkes.
Proceedings of the Biochemical Society, Vol 128, No 4, p 145, July 1972.

Descriptors: *Anaerobic digestion, *Industrial wastes, *Waste water treatment, *Deoxygenation, Domestic sewage, Self purification, Activated sludge, Effluents, Organic wastes, Filtration, Biological treatment, *Path of pollutants, Water pollution control.
Identifiers: *Biochemical purification, Oxidation pond process, Percolating filters.

The discharge of effluents with a high concentration of putrescible organic matter has similar effects to the discharge of domestic sewage. Initially, the heterotrophic component is encouraged, which produces an imbalance in the system. This activity reduces the organic content of the water and balance is restored by a process known as self-purification. In the process deoxygenation occurs in the river. Factors affecting the oxygen balance in rivers polluted with organic matter have been studied to provide formulations for predicting the deoxygenation effects of a known load of organic pollutant. Aspects of the natural biochemical purification processes occurring in rivers are discussed, and the use of these processes in waste treatment plants is noted. Examples cited are anaerobic digestion and biological oxidation by percolating filters, the activated-sludge process, and the oxidation-pond process. (Murphy-Texas)
W73-03673

THE UPTAKE AND PERSISTENCE OF PESTICIDES IN AN ALGAE-LADEN ENVIRONMENT,
Virginia Polytechnic Inst., Blackburg.
H. H. Yeh.
Available from University Microfilms, Inc., Ann Arbor, Michigan 48106. Order No 70-13 696. Xerox $7.00; Microfilm $4.00. Ph. D. Dissertation, 1970, 150 p.

Descriptors: *Pesticides, *Organic pesticides, Biomass, Euglena, Chlorella, *Algae, Microbial degradation, Distillation, Environment, Equilibrium, *Pesticide removal, *Path of pollutants, Waste water treatment, Water pollution control.
Identifiers: Lindane, Parathion, CIPC, Chemical hydrolysis.

The fate of pesticides in algae-laden environment was studied to obtain a better knowledge of the potential hazards of pesticides and to develop means to remove and control their presence in water. Batch-type sorption tests were run to determine the kinetics of uptake and the distribution at equilibrium of pesticides in a water-biomass environment. Pesticide sorption occurred between the algal species Chlorella and lindane, and between the algal species Euglena and lindane, parathion and CIPC. The extent of pesticide uptake varied with the species and with the pesticides. Uptake was relatively rapid and equilibrium was reached in two to three days. About 60 to 80 percent of the pesticides studied could be removed from the solution by sorption, chemical hydrolysis, microbiological degradation, and physical co-distillation. (Murphy-Texas)
W73-03676

THREE METHODS FOR DETERMINING DISSOLVED OXYGEN CONCENTRATIONS NEAR FISH EMBRYOS (FISHERY SIGNIFICANCE),
New York Cooperative Fishery Unit, Ithaca, N.Y.
R. W. Miller.
Prog Fish-Cult. Vol 34, No 1, p 39-42. 1972. Illus.
Identifiers: *Analytical techniques, *Dissolved oxygen, Embryos, Fish, Fishery, Probes, Winkler.

A micro-Winkler method and 2 probes (A Beckman Macro Electrode, and a Yellow Springs Instruments probe specially modified for field use) were tested for their suitability in measuring dissolved O2 concentrations adjacent to fish embryos. It was required that the method not disturb O2 depletion zones created by the respiring embryos. The micro-Winkler method made a minimal disturbance since only 1-to 1.5-ml water samples were used, but the readings were 3% to 15% below the Winkler readings used as standards. The Beckman Macro Electrode required only 5mm/sec movement of the probe tip to achieve best accuracy (O.3 ppm mean deviation from the standard values) when used in the laboratory. The field probe was automatically temperature-compensated and highly portable but required 10 cm/sec movement of the probe tip to achieve accuracy matching the Beckman instrument.--Copyright 1972, Biological Abstracts, Inc.
W73-03695

THE EFFECT OF THE OBSERVATION TIME ON TURBULENT DIFFUSION IN THE ATMOSPHERE,
Mitsubishi Heavy Industries Ltd., Nagasaki (Japan). Nagasaki Technical Inst.
For primary bibliographic entry see Field 02B.
W73-03723

THE INTERACTION OF LOCAL WEATHER AND AIR POLLUTION PROBLEMS,
Imperial Coll. of Science and Technology, London (England).
R. S. Scorer.
Int J Environ Stud, Vol 1, No 4, p 259-265, 1971.
Identifiers: Interaction, *Air pollution, *Weather.

Scientists must not work too remotely from the crude phenomena of air pollution or disproportionate effort will be applied in useless directions. The abolition of pollution must not be sought but rather arrange the priorities so that the earliest and largest effort is placed where it will be most beneficial. It is soon discovered that the priorities vary according to the local weather, and of course according to the location and nature of the local pollution sources. 'Average weather conditions' are often meaningless in this context, and local conditions affect the results on various scales, namely architectural, urban, in valleys and mountains, height of cloud base, and according to the efficacy of the scavenging mechanisms. Certain sources may create quite new problems in special climates and local conditions may exert an overriding effect on the planning of surveys. Modelling is considered to be of little value compared with field observations.--Copyright 1972, Biological Abstracts, Inc.
W73-03724

CONTINUITY IN THE DISTRIBUTION OF SURFACE CHLOROPHYLL,
Woods Hole Oceanographic Institution, Mass.
C. J. Lorenzen.
J Cons Cons Perm Int Explor Mer, Vol 34, No 1, p 18-23, 1971, Illus.
Identifiers: *Chlorophyll, Continuity, *Distribution, *Thermal gradients.

The horizontal distribution of surface chlorophyll is continuous, with discontinuities associated with thermal gradients. Variations in chlorophyll levels are small in hydrographically uniform areas, and its distribution becomes more variable in hydrographically complex situations such as areas influenced by land run-off, strong tidal action and upwelled waters. Continuous measurements of chlorophyll and other biologically affected parameters are most useful in designing sampling programs, relating discrete samples to the distribution of parameters in the field, or locating positions for special studies.--Copyright 1972, Biological Abstracts, Inc.
W73-03729

TEMPERATURE FLUCTUATIONS AT A FIXED POSITION IN SAN DIEGO BAY,
Naval Undersea Research and Development Center, San Diego, Calif.
For primary bibliographic entry see Field 02L.
W73-03731

ANALOG MODEL STUDY OF GROUND--WATER FLOW IN THE REHOBOTH BAY AREA, DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 02L.
W73-03745

FOREST PRODUCTS POLLUTION CONTROL, ANNOTATED BIBLIOGRAPHY (EXCLUDING PULP AND PAPER),
Western Forest Products Lab., Vancouver (British Columbia).
For primary bibliographic entry see Field 05G.
W73-03746

RELEASE OF NITROGEN FROM SULFUR--COATED UREA IN FLOODED SOIL,
National Fertilizer Development Center, Muscle Shoals, Ala.
P. M. Giordano, and J. J. Mortvedt.
Agronomy Journal, Vol 62, No 5, p 612-614, 1970. 1 tab, 4 fig, 6 ref.

Descriptors: Soil moisture, *Nitrogen, Rice, *Absorption, *Ureas.
Identifiers: Nitrogen release, Phosphorus placement, Slow-release N fertilizer, *Sulfur-coated urea.

Laboratory and greenhouse experiments were conducted to investigate the release of N in Mountview soil from sulfur-coated urea (SCU) and the subsequent uptake of N by rice (Oryza sativa L. var. 'Nato'). The rate of N release was much greater in moist than in flooded soil. Granules of SCU became coated with FeS after 2 weeks in flooded soil. When the flooded soil was dried to about field capacity, oxidation of the FeS coatings appeared to seal the granules so that very little N was released. In general, the release of N was slightly greater from SCU applied to limited soils fertilized with P. Dry matter production and uptake of N by rice from SCU was similar to that from uncoated urea when both N sources were incubated in moist soil for at least 2 weeks prior to planting and flooding. Urea applied to the soil immediately before flooding was also effective, but SCU was not. (See also W73-03800) (Skogerboe - Colorado State)
W73-03759

PREDICTION OF THE NITROGEN REQUIREMENT OF FIELD CORPS. PART I. THEORETICAL MODELS OF NITROGEN RELEASE,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W73-03762

PREDICTION OF NITROGEN FERTILIZER REQUIREMENTS OF FIELD CROPS. II. APPLICATION OF THEORETICAL MODELS TO MALTING BARLEY,
Forest Service (USDA), La Grande, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 02G.
W73-03763

OXYGEN DIFFUSION IN THE SOIL-PLANT SYSTEM. I. A MODEL,
California Univ., Riverside. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 02I.
W73-03764

OXYGEN DIFFUSION IN THE SOIL-PLANT SYSTEM. II. RESPIRATION RATE, PERMEABILITY, AND POROSITY OF CONSECUTIVE EXCISED SEGMENTS OF MAIZE AND RICE ROOTS,
California Univ., Riverside. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 02I.
W73-03765

OXYGEN DIFFUSION IN THE SOIL-PLANT SYSTEM. IV. OXYGEN CONCENTRATION PROFILES, RESPIRATION RATES, AND RADIAL OXYGEN LOSSES PREDICTED FOR RICE ROOTS,
California Univ., Riverside. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 02I.
W73-03766

THE DISTRIBUTION OF NITRIFYING BACTERIA IN SOIL AGGREGATES,
Tohoku Univ., Sendai (Japan). Inst. for Agricultural Research.
M. Nishio, and C. Furusaka.
Soil Science and Plant Nutrition, Vol 16, No 1, p 24-29, 1970. 5 fig, 11 ref.

Descriptors: *Soil aggregates, Bacteria, *Percolation, Distribution, *Soil bacteria, Nitrogen fixing bacteria, *Path of pollutants.
Identifiers: Sonic vibration method, Washing method.

The distribution of nitrifying bacteria in soil aggregates which were percolated with ammonium or nitrite was studied using the 'washing and sonic vibration method.' In air-dried aggregates most nitrifying bacteria were observed to be present in the inner-fraction. Treated with percolation, nitrifying bacteria in the outer-fraction increased more vigorously than those in the inner-one. When the percolated aggregates were desiccated over P2O5 or treated with HgCl2 solution, the bacteria in the outer-fraction were killed more easily than those in the inner-fraction. These results are well explained as in the case of heterotrophic bacteria by the concept that an aggregate as a habitat of bacteria can be divided into 2 distinct sites, i.e., the inner and the outer-site. (Skogerboe-Colorado State)
W73-03796

THE CHEMICAL POLLUTION OF DRINKING WATER,
Liverpool Univ. (England).
For primary bibliographic entry see Field 05F.
W73-03815

MANAGEMENT ASPECTS OF GROUND-WATER CONTAMINATION,
Geological Survey, Washington, D.C.
H. E. LeGrand.
Journal Water Pollution Control Federation, Vol 36, p 1133-1145, 1964. 5 fig, 9 ref.

Descriptors: Hydraulics, Hydrology, *Management, Groundwater, *Groundwater movement, Path of pollutants, *Pollution abatement, Artificial recharge, *Waste disposal, Injection wells, Saline water intrusion, Mine drainage, Zone of aeration, Zone of saturation.

Ways that groundwater can be contaminated are outlined; they include disposal of wastes, artificial recharge, accidents, salt water encroachment, and mining operations. A classification of contamination problems as to the approach from which officials should consider them is given. The hydrogeologic framework, often ambiguously referred to, is discussed in detail; parameters involved include porosity and permeability, vertical zonations, the difference in environments between the zones of aeration and saturation, the natural movement of groundwater as influenced by man's activities (wells and drains), and the attenuation of contaminants by various processes. (Smith-NWWA)
W73-03833

WATER QUALITY DETERMINATION FROM SPONTANEOUS-POTENTIAL ELECTRIC LOG CURVES,
Saskatchewan Univ., Saskatoon. Dept. of Geological Sciences.
J. A. Vonhof.
Journal of Hydrology, Vol 4, p 341-347, 1966. 2 fig, 1 tab, 4 ref.

Descriptors: Logging (Recording), Drilling fluids, *Water quality, *Specific conductivity, Ions, Electrical well logging, *Glacial aquifers, Glacial drift, Groundwater, Test wells.
Identifiers: Spontaneous potential, *Ionic concentration, Saskatchewan.

Spontaneous-potential electric logs from test-holes drilled in the Pleistocene deposits of the province of Saskatchewan have been successfully used to determine the water quality of the aquifers encountered. Information from about 200 water samples all representing drift water was used to relate the ionic concentration to the specific conductance. Two enveloping curves were drawn on a specific conductance vs. ionic concentration graph to enclose the range of concentration values which may exist for one specific conductance value. The borehole fluids themselves are the main sources of error, by introducing different ionic constituents into the formation, thus changing the specific conductance. If, however, the specific conductance of the drilling mud is much less than the specific conductance of the formation water, the method has been found to be valid. (Campbell-NWWA)
W73-03837

INVESTIGATION OF ALLEGED GROUND--WATER CONTAMINATION, TRI-RUE AND RIDE OIL FIELDS, SCURRY COUNTY, TEXAS,
Texas Water Commission, Austin. Ground Water Div.
R. L. Crouch.
Texas Water Commission Publication LD-0464-MR, March, 1964. 16 p, 5 fig, 3 tab, 4 ref.

Descriptors: *Water quality, *Brine disposal, Oil wastes, Oil industry, Geologic formations, Logging (Recording), *Texas, Injection wells, Saltation, *Groundwater, Groundwater resources, Sandstones, Chemical analysis, *Seepage, *Path of pollutants.
Identifiers: Driller's logs.

Water wells located and sampled during this investigation showed no indication of contamination from oil-field brines. The lithologic characteristics of the Santa Rosa aquifer in the area of investigation prevent rapid downward percolation of the brine being disposed of into unlined surface pits, although continuous long-term use of pits probably will result in contamination of the upper aquifer. Brine lost by overflow or seepage from these pits moves primarily laterally; uncased water wells located near, downslope, or down the hydraulic gradient from sources of brine are in danger of contamination. The use of the shallow Permian zone for salt water disposal constitutes a potential threat to usuable water resources in the area. (Campbell-NWWA)
W73-03839

WELL CONTAMINATION--PART III, SOLUTION FOR POLLUTION,
For primary bibliographic entry see Field 05D.
W73-03848

SAPROBIOLOGICAL RESEARCH IN THE JIU RIVER BASIN (IN RUSSIAN),
Laboratorul de Hidrobiologia, Craiova (Rumania).
For primary bibliographic entry see Field 05C.
W73-03860

BIOLOGICAL STUDIES ON THE WATER OF THE MOTRU RIVER BASIN (IN RUSSIAN),
Bucharest Univ. (Rumania).
For primary bibliographic entry see Field 05C.
W73-03861

BIODEGRADATION OF PIG WASTE: BREAKDOWN OF SOLUBLE NITROGEN COMPOUNDS AND THE EFFECT OF COPPER,
School of Agriculture, Aberdeen (Scotland).
K. Robinson, S. R. Draper, and A. L. Gelman.
Environ Pollut. Vol 2, No 1, p 49-56. 1971. Illus.
Identifiers: *Copper sulfate, Degradation, *Nitrogen, Oxygen, *Pig wastes, *Biodegradation.

The common practice of supplementing pig rations with copper sulphate leads to the excretion of copper in the feces, producing levels in the slurry as high as 750 ppm. The aerobic biodegradation of pig waste under laboratory conditions was progressively inhibited up to 500 ppm of added copper. This concentration is sufficient to prevent reduction in Chemical Oxygen Demand and degradation of soluble nitrogen compounds.--Copyright 1972, Biological Abstracts, Inc.
W73-03897

5C. Effects of Pollution

FLUSHING OF SMALL SHALLOW LAKES,
Washington State Univ., Pullman. R. L. Albrook, Hydraulic Lab.
Claud C. Lomax, and John F. Orsborn.
Copy available from GPO Sup Doc as EPI.16: 16010 DMG, 12/71, $0.50; microfiche from NTIS as PB-213 840, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 39 p, 16 fig, 7 tab, 7 ref., appendix. EPA Program 16010 DMG, 12/71.

Descriptors: *Lakes, *Circulation, *Laboratory tests, *Water pollution control, Shallow water, Water quality, Mathematical studies, Velocity, Hydraulic models, Hydraulics, Flow, Diffusion.
Identifiers: *Flushing, Flow characteristics.

Flushing of a lake means reducing the pollution by clean inflow with an equivalent outflow of polluted water, a process by which clean water both displaces and mixes with the polluted water. Parameters influencing the effectiveness of the cleansing stream, most important and manageable under laboratory conditions, were investigated. Parameters studied were: inlet velocity, inlet width, depth, and basin shape. Testing was conducted on two depths, two inlet widths, three inlet velocities, and four elliptical basins. Primary purpose of the project was to evaluate the various parameters to determine their influences on flushing efficiency, and develop prediction equations based on geometric and flow characteristics of the systems tested. Analyses were completed to develop a test program, analyze the system for comparison with experimental results, and develop prediction equations which incorporate analytical and experimental results of the study. Width of basin perpendicular to the axis of flow is an important parameter. Narrower basins have better flushing action and less erratic flow patterns than wider basins. Pollution remaining in a basin after any interval of flushing is primarily dependent on the time of the flushing interval divided by the detention time of the basin. (Jones-Wisconsin)
W73-03252

DIATOM POPULATIONS CHANGES IN LAKE GEORGE, N.Y.
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.

Available from the National Technical Information Service as PB-213 811, $3.00 in paper copy, $0.95 in microfiche. FWI Report 72-1 through 72-8. N. L. Clesceci and S. L. Williams, editors, July 1972. 212p, 96 fig, 26 tab, 85 ref, 1 append, (1972). OWRR C-2209 (No 3387) (1).

Descriptors: Alkalinity, Ammonia, Aquatic algae, Aquatic environment, Primary productivity, *Bottom sediments, *Computer models, *Diatoms, Dissolved oxygen, *Inorganic compounds, *Lakes, Light intensity, *Mathematical models, New York, Nitrogen, *Nutrients, *Periphyton, Phosphorus, *Plankton, Precipitation, *Regression analysis, *Sedimentation, Solar radiation, Spatial distribution, Trophic level, *Water analysis, *Water temperature, Water quality, Biomass, Zinc, Copper.
Identifiers: *Lake George (N.Y.), Aging (Biological), Air temperature, Bathymetry, *Cluster analysis, Micronutrients, Silicon, *Trend-surface analysis.

The diatom populations in the plankton and periphyton at depths of three, nine and fifteen meters in the north and south basins of Lake George have been characterized and measured over a three year period. Measurements of environmental factors, including solar radiation, temperature and algal nutrients concentrations, were also made at the same depths and locations. Relationships were established between environmental factors and numbers of diatoms through regression analysis. Diatom assemblages in recent surficial sediments and in consolidated sediment cores were characterized and present and past sedimentation rates determined. The measurements and analyses performed support the conclusion that pronounced changes in the planktonic diatom populations have been taking place in the last twenty to fifty years. These changes are indicative of a rapid cultural eutrophication with the south basin of Lake George particularly susceptible. A predictive mathematical model was successfully tested with the data obtained making it possible to predict the future growth of certain diatoms in the lake from inputs of phosphorus and inorganic nitrogen. (Clesceri-Rensselaer)
W73-03258

BIOLOGICAL AND CHEMICAL OBSERVATIONS IN MUMFORD AND PALMER COVES (GROTON, CONN.) SEPTEMBER 1970-SEPTEMBER 1971,
Connecticut Univ., Noank. Marine Research Inst.
For primary bibliographic entry see Field 06G.
W73-03262

ALGAL GROWTH AND DECOMPOSITION: EFFECTS ON WATER QUALITY, PHASE II. NUTRIENT REGENERATION, COMPOSITION, AND DECOMPOSITION OF ALGAE IN BATCH CULTURE,
Kentucky Water Resources Inst., Lexington.
E. G. Foree, and R. L. Barrow.
Available from the National Technical Information Service as PB-213 838, $3.00 in paper copy, $0.95 in microfiche. Research Report No. 31, October 1970. 90 p, 20 fig, 8 tab, 40 ref, 2 append. OWRR A-023-KY (3) 14-31-0001-3217.

Descriptors: *Algae, *Cycling nutrients, *Decomposing organic matter, *Aerobic conditions, *Anaerobic conditions, Water quality, Chemical composition, Lipids, Carbohydrates, Chlorophyta, Cyanophyta, Eutrophication, Nitrogen, Phosphorus, Proteins, Mathematical models, Chemical oxygen demand, Laboratory tests, Cultures, Computer programs, Suspended solids, Degradation (Decomposition).

If a meaningful correlation between initial characteristics and refractory organic fraction of algal cultures can be found, it will allow the prediction of this refractory fraction from initially measurable parameters. Under dark, constant temperature laboratory conditions, decomposition and associated nutrient regeneration of three unialgal cultures and one mixed culture containing an indigenous population of bacteria and microscopic animals were studied. These cultures were inoculated with decomposer populations and subjected to anaerobic and aerobic environments after periods of nutrient-deficient growth. Decomposition extent was determined from percentage volatile suspended solids and percentage particulate COD remaining after 200 decomposition days. Significant algal portions remained undecomposed in both cases. A fraction of the initial nitrogen and phosphorus was held within this refractory organic fraction; the extent of aerobic decomposition was greater than the anaerobic and the average extent of regeneration of both nitrogen and phosphorus was greater for aerobic than anaerobic conditions. Correlation between initial composition of algal matter and extent to which it decomposed was made. A mathematical model for predicting extent of nitrogen and phosphorus regeneration proposed by previous researchers was further evaluated. The critical algal nitrogen and phosphorus levels above which excess regeneration occurred were 7% and 0.7% by weight, respectively. (Jones-Wisconsin)
W73-03275

HYDROLOGIC INVESTIGATIONS OF SMALL WATERSHEDS IN OHIO: PHASE II. 1969-1972,
Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 02A.
W73-03277

SIMULATION OF WATER QUALITY ENHANCEMENT IN A POLLUTED LAKE, A CASE STUDY OF VANCOUVER LAKE, WASHINGTON,
Washington State Water Research Center, Pullman.
C. N. Lin, S. K. Bhagat, and J. F. Orsborn.
Bulletin 324, January 1972. 120 p. 31 fig, 13 tab, 63 ref, 4 append. EPA Programs 16080 ERP and 16080 ERQ.

Descriptors: *Water quality, Water pollution, *Lakes, *Water pollution control, *Mathematical models, *Washington, Hydraulic properties, Conduits, Dredging, Seasonal, Computer models, Dissolved oxygen, Algae, Bacteria, Columbia River, Pollution abatement, Model studies, Water purification, Hydrodynamics, Hydraulic engineering, Aquatic life, Flow rates, Seasonal.
Identifiers: *Vancouver Lake (Wash.), *Flushing.

A simulation model was designed to establish a meaningful set of relationships between dissolved oxygen, phytoplankton, zooplankton, nutrients, total bacteria, biochemical oxygen demand, and the flow volume; it was applied to Vancouver Lake, Washington as a test for the solution of problems in flushing polluted water from lakes. The system of equations is integrated numerically which permits prediction of the hydraulic characteristics and water quality conditions before and after introduction of better quality water for flushing pollutants. Lake water quality can be improved by introducing an external source of water to provide flushing action by way of a conduit, by dredging lake bottom muds, and/or by curtailing external sources of pollution. Reliability of the mathematical models was verified with data collected from laboratory and field experiments from Vancouver Lake studies. These furnished prototype hydrographs and dissolved oxygen levels in the test lake, discharges in Lake River, and other quality data for verifying the reliability of the mathematical models. Verifications were made by comparing the simulated results with those observed in the field. The developed simulation model and results of related studies could be of value in similar pollution investigations and abatement purposes. (See aslo W72-08564) (Jones-Wisconsin)
W73-03310

CONFERENCE REPORT ON H.R. 9727, MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT OF 1972.
For primary bibliographic entry see Field 06E.
W73-03315

NUTRIENTS AND EUTROPHICATION IN THE PAMLICO RIVER ESTUARY, N.C. - PRELIMINARY RESULTS, 1971-72,
North Carolina State Univ., Raleigh. Dept. of Zoology.
B. J. Copeland.
North Carolina Water Resources Research Institute Interim report, November 1972. 23 p, 9 fig, 1 tab, 14 ref. OWRR B-041-NC (1). 14-31-0001-3623.

Descriptors: *Eutrophication, *Trophic level, *Nutrients, *Phosphorus compounds, *Nitrogen compounds, *North Carolina, *Water pollution effects, Mine wastes.
Identifiers: *Pamlico River estuary (NC).

Studies were initiated in 1965 to study the effects of expected increases in phosphorus concentrations in the Pamlico River Estuary from phosphate mining operations onshore. A series of reports have followed, reporting phosphorus concentrations, hydrography, phytoplankton, benthic animal populations, zooplankton, the effects of phosphorus on algae, and a summary of phosphorus effects for the initial period of work during 1965-69. During 1969-71, the sampling was expanded to include nitrogen concentrations in the estuary as well as nutrient concentrations in tributary streams. A preliminary analysis of data taken during 1971-72 for nutrients and response of the biological components is presented.
W73-03401

SEASONAL COMPOSITION OF TERMPERATE PLANKTON COMMUNITIES: FREE AMINO ACIDS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
H. P. Jeffries.
Limnology and Oceanography, Vol 14, No 1, p 41-52, January 1969. 5 fig, 5 tab, 20 ref. FWPCA Program 18050 DTX 01/69, WP-00858.

Descriptors: *Plankton, Biological communities, *Amino acids, Chemical analysis, Temperate, *Seasonal, *Succession, Animal physiology, *Productivity, Diatoms, Crustaceans, Larval growth stage, Coasts, Estuaries, *Rhode Island.
Identifiers: Free amino acids, *Rhode Island sound.

Patterns of seasonal succession and free amino acid composition have several features in common in marine plankton. Free amino acid levels are usually higher in summer communities than winter ones with the main changes occurring during times of community change in late spring and early winter. These levels are also an index of physiological condition and productive capacity. A very high degree of intercorrelation within the free amino acid pools is revealed by factor analysis. Phytoplankton-microzooplankton shows greater consistency of quantitative change than does zooplankton. (Ensign-PAI)
W73-03441

SEASONAL COMPOSITION OF TEMPERATE PLANKTON COMMUNITIES: FATTY ACIDS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
H. P. Jeffries.
Limnology and Oceanography, Vol 15, No 3, p 419-426, May 1970. 2 fig, 1 tab, 20 ref. FWPA Program 18050 DTX 05/70, WP-00858.

Descriptors: *Plankton, Biological communities, Chemical analysis, *Lipids, Temperate, *Seasonal, *Succession, Aquatic populations, Standing crops, *Productivity, Dominant organisms, Diatoms, Annual, *Rhode Island.
Identifiers: *Fatty acids, Palmitoleic acid, Palmitic acid, Flagellates, Oleic acid, Stearidonic acid, Annual cycle variation, *Narragansett Bay.

The seasonal succession and productivity of populations influence the variation of fatty acid composition of plankton in Narragansett Bay, Rhode Island. During vernal warming the ratio of palmitoleic acid to palmitic acid declines from 2.0 to ca. 0.3, indicating the change in dominance from diatoms to flagellates. Among zooplankton, the ratio is twice as high in the winter dominant copepod Acartia clausi, as in the summer species Acartia tonsa. Palmitoleic acid and palmitic acid vary through the year as do the oleic and stearidonic acids. (Ensign-PAI)
W73-03442

DOMINANCE-DIVERSITY RELATIONSHIPS OF THE FREE AMINO ACIDS IN COASTAL ZOOPLANTON,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
H. P. Jeffries, and L. Alzara.
Comparative Biochemistry and Physiology, Vol 37, p 215-223, 1970. 4 fig, 3 tab, 17 ref. FWPCA Program, 18050 DTX 04/70.

Descriptors: Coasts, *Zooplankton, *Diversification, *Dominant organisms, *Amino acids, *Copepods, *Salinity, *Seasonal, *Temperature, Sea water, Estuarine environment, Fresh water, Biochemistry.
Identifiers: Free amino acid composition, Calanus finmarchicus, Pseudocalanus minutus, Acartia clausi, Acartia tonsa, Eurytemora affinia, Diaptomus sp.

Six copepod species along a salinity gradient from the open ocean to fresh water were studied for their free amino acid composition. Half of the variation in total concentration was due to salinity with the remainder due to seasonal temperature change and related factors. The basic amino acids became more important and glycine, alanine and taurine decreased as the study progressed from marine species through three estuarine species and finally to the fresh water species which showed a comparatively uniform pattern of composition. An index of biochemical dominance illustrates this relationship. (Ensign-PAI)
W73-03443

QUARTERLY PROGRESS REPORT, JULY 1 - SEPTEMBER 30, 1972.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05G.
W73-03444

THE STRUCTURE OF AN EXPERIMENTAL INFAUNAL COMMUNITY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
N. J. Blake, and H. P. Jeffries.
Journal of Experimental Marine Biology and Ecology, Vol 6, p 1-14, 1971. 5 fig, 3 tab, 18 ref. FWPCA Program, 18050 DTX 00/71.

Descriptors: *Estuaries, Animal groupings, *Mollusks, *Biological communities, Aquatic populations, Enfironment, *Speciation, *Structural analysis, Sediments, *Rhode Island.
Identifiers: Nucula proxima, Nepthys incisa, Yoldia limatula, Community structure, Species composition, *Narragansett Bay.

The structure of the infaunal community Nucula proxima-Nepthys incisa of Narragansett Bay, Rhode Island, was studied for one year in wooden tanks. The control tank received undiluted bay water (S 30-32%) and the experimental tank received bay water diluted to S 20%. The density of Nucula more than doubled over the 12 month period in the control tank while the number decreased sharply during spring and then later increased to almost the initial density in the experimental tank. Fourteen additional species colonized in the control tank but only four survived in the experimental tank. In the control tank Nucula grew 1.0-2.0 mm/yr and Yoldia grew 10.0 mm/yr. In the experimental tank Nucula grew 0.5 mm/yr and Yoldia 5.0 mm/yr. Growth rates could not be measured for Nepthys but showed growth in both tanks. (Ensign-PAI)
W73-03445

DISTRIBUTION OF DISSOLVED OXYGEN IN THE WATERS OF WESTERN LONG ISLAND SOUND,
State Univ., of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 05B.
W73-03449

THE UPTAKE OF RADIONUCLIDES BY I--GROUP PLAICE (PLEURONECTES PLATESSA) OFF THE CUMBERLAND COAST, IRISH SEA,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
R. J. Pentreath, and D. F. Jefferies.
Journal of the Marine Biological Association of the United Kingdom, Vol 51, No 4, p 963-976, 1971. 8 fig, 4 tab, 25 ref.

Descriptors: *Radioisotopes, *Radioactive wastes, *Cesium, Fish, *Absorption, Seawater, Sediments, Fish diets, Food chains, Water pollution effects, Fish physiology, Ecology.
Identifiers: Cerium144, Ruthenium106, Zirconium95/Niobium95, Cumberland coast, *Irish Sea.

A 7-month survey in the area of the UKAEA plant at Windscale, Irish Sea, has been conducted to study the accumulation of radionuclides by I-group plaice, Pleuronectes platessa L. Cesium-137 was the principal isotope found in the flesh while 144Ce,m106Ru and 95Zr/95Nb were found in the gut. The 137Cs levels in the flesh were studied with reference to 137Cs fluctuations in sea water, sediment and the gut contents. The calculated intake of 137Cs from food appeared to fluctuate most closely with the Nephtys portion of the three major dietary components. Of the nuclides measured, Cesium appeared to be the only one accumulated up the food chain. (Ensign-PAI)
W73-03450

ENVIRONMENTAL STUDY OF THE SEWAGE OUTFALL AREA AT SAN CLEMENTE ISLAND AN OPEN-OCEAN SEWAGE DISPOSAL MODEL,
Naval Undersea Research and Development Center, San Diego, Calif.
For primary bibliographic entry see Field 05B.
W73-03452

THE EFFECTS OF AGRICULTURAL WASTE WATER TREATMENT ON ALGAL BIOASSAY RESPONSE,
Environmental Protection Agency, San Francisco, Calif. Region X.

Copy available from GPO Sup Doc as EP1.16:13030 ELY 08/71-9, $1.00; microfiche from NTIS as PB-213 891, $0.95. Water Pollution Control Research Series, August 1971. 59 p, 8 fig, 14 tab, 9 ref. EPA Project 13030 ELY 08/71-9.

Descriptors: *Eutrophication, *Algal control, Chlorophyll, *Bioassay, *Denitrification, Nitrates, Nitrogen, *Fluorometry, *Tile drains, Waste water treatment.

Laboratory bioassay experiments were performed to test the effect on algal growth of agricultural waste water before and after the waste water had been subjected to two different nitrogen removal processes. The waste waters were added in various percentages to San Joaquin River Delta water for bioassay. The algal growth throughout time was monitored by chlorophyll fluorescence techniques. The fluorescence measurements showed logarithmic growth similar to the type usually observed in the Delta Water over the vernal growth period. The laboratory experiments gave positive statistical evidence that the untreated agricultural waste water would promote substantial algal growth above that of the San Joaquin River controls. Both nitrogen removal processes were equally effective in lowering the algal growth to that of the Delta water controls as long as the nitrate-nitrogen level in each removal system had been lowered to approximately 2 mg N/l, or less.
W73-03502

AN INVESTIGATION INTO RECREATIONAL WATER QUALITY, WATER QUALITY CRITERIA DATA BOOK, VOL. 4,
Envirogenics Co., El Monte, Calif.
B. J. Mechalas, K. K. Hekimian, L. A. Schinazi, and R. H. Dudley.
Copy available from GPO Sup Doc as EP1.16:18040 DAZ 04/72, $3.00; microfiche from NTIS as PB-214 154, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, April 1972. 256 p, 32 fig, 45 tab, 946 ref, append. EPA Project 18040 DAZ 04/72.

Descriptors: *Recreation, *Public health, *Standards, Salmonella, Viruses, Pesticides, Beaches, Mathematical models, Risks, Temperature, Hydrogen ion, Concentration, *Water quality standards.
Identifiers: *Quality criteria.

A new technique has been developed for establishing firm criteria for health risks associated with recreational water bodies. The basis of the method is a mathematical treatment of medical dose-response data in conjunction with the probability of exposure over a period of time to a given level of the potentially harmful factor, such that a quantitative risk can be assigned to the recreational activity. Once a public health jurisdiction has established an acceptable level of risk, curves produced by electronic data processing equipment can be used to ascertain whether a particular water should be open to the public. (See also W72-08157, W72-08158, and W73-01976) (Wilson-Envirogenics)
W73-03503

THE ROLE OF SLUDGE WORMS IN EUTROPHICATION,
National Environmental Research Center, Corvallis, Oreg.
R. O. Brinkhurst.
Copy available from GPO Sup Doc as EP1.23:72004, $1.25; microfiche from NTIS as PB-213 894, $0.95. Environmental Protection Agency report EPA-R3-72-004, August 1972. 68 p, 16 fig, 15 tab, 21 ref, append. EPA Project 16010 ECQ.

Descriptors: *Benthos, Sediments, Ecology, Energy, *Nitrogen, *Eutrophication, Aquatic microorganisms, Water pollution effects, Indicators, Respiration, Cycling nutrients, *Canada, *Lake Ontario, *Lake sediments.
Identifiers: Tubifex tubifex, Limnodrilus hoffmeisteri, Peloscolex multisetosus, *Sludge worms, Laurentian Great Lakes, *Toronto Harbour.

In grossly polluted Toronto Harbour, Lake Ontario, worm populations (x 96,000/m sq, 18.3 g AF dry wt./m sq) assimilates 1,743 kcals/m sq/yr, produces 1550 kcals, 7 tons nitrogen standing stock of worms circulates 830 tons/yr of total input 830 tons. Produ sqtion and respiration values for mixed species cultures differ markedly from those of pure cultures. Worms feed selectively, digest bacteria selectively, actively irrigate sediments. They retrieve materials from the energy sink via production and irrigation. Production of benthos depends on quality of sedimenting material, not just total energy or material content. (EPA abstract)
W73-03513

FIRST FOOD OF LARVAL YELLOW PERCH, WHITE SUCKER, BLUEGILL, EMERALD SHINER, AND RAINBOW SMELT,
National Water Quality Lab., Duluth, Minn.
R. E. Siefert.
Transactions of the American Fisheries Society, Vol 101, No 2, p 219-225. April 1972. 4 fig, 6 tab, 12 ref.

Descriptors: *Fish diets, Yellow perch, Suckers, Sunfishes, Shiners, Smelts, *Larval growth stage, *Rotifers, *Zooplankton, *Copepods, Eutrophrication, Lakes.

Entire digestive tract contents from larval yellow perch, white sucker, bluegill, emerald shiner, and rainbow smelt along with plankton samples taken concurrently with fish samples, were identified and counted. Food selection was calculated by use of Ivlev's electivity index. First food of yellow perch from an eutrophic lake were copepod nauplii and cyclopoid copepods; after fish reached 11 mm in length Bosmina coregoni was the dominant food. Yellow perch from an oligotrophic lake fed first on the rotifer Polyarthra, and to a lesser extent on copepod nauplii, after fish reach 11 mm cyclopoid copepods became the most important food items. Rotifers contributed an important portion of the early diet of white sucker; copepod nauplii and Cyclops bicuspidatus provided the remainder of the diet. Cladocerans increased in numbers after the fish reached 14 mm. Food of bluegills at the initiation of feeding consisted of Polyarthra and copepod nauplii. When fish reached 7 mm other rotifers and cyclopoid copepods appeared in the diet, and at 8 mm cladocerans become the dominant food and remained so for larger fish. Rotifers were the dorminant food of first-feeding emerald shiners, and they remained an important food of larger fish. Copepod nauplii became a dominant food when fish reached 10 mm, and Cyclops biscuspidatus and cladocerans were important foods in fish 7 mm and larger. Algae were found in fish of all sizes, and calanoid copepods were found in fish 13 mm and larger. First-feeding rainbow smelt contained Cyclops biscupidatus, copepod nauplii, diatoms, and green algae; C. bicuspidatus was the principal food until fish reached 21 mm. Calanoid copepods succeeded as the dominant food for larger fish. (EPA abstract)
W73-03652

ACUTE AND CHRONIC TOXICITY OF CADMIUM TO THE FATHEAD MINOW (PIMEPHALES PROMELAS),
National Water Quality Lab., Cincinnati, Ohio. Newtown Fish Toxicology Lab.
Q. H. Pickering, and M. H. Gast.
Journal Fisheries Research Board of Canada, Vol 29, No 8, p 1099-1106, 1972. 6 tab, 22 ref.

Descriptors: Water pollution effects, *Cadmium, *Toxicity, *Minnows, Growth, Fish reproduction, Fish eggs, Juvenile fish, Fry, Incubation, Hatching, Laboratory tests, Heavy metals.
Identifiers: *Chronic effects, *Pimephales promelas.

Two continuous-flow bioassays on the chronic toxicity of cadmium to the fathead minnow (Pimephales promelas Rafinesque) indicated that the maximum acceptable toxicant concentration (MATC) for this species is between 57 and 37 microgram Cd/liter. The experimental concentration of 57 microgram Cd/liter decreased survival of the developing embryos, the embryos being the most sensitive life stage. At lower concentrations of 37 to 4.5 microgram Cd/liter, no adverse effect on survival, growth, or reproduction was found. Application factors based on the acute bioassays are discussed in relation to the great variation in toxicity values. (EPA abstract)
W73-03653

MERCURY CONTENT OF HUMAN TISSUES DURING THE TWENTIETH CENTURY,
Saratoga General Hospital, Detroit, Mich.
For primary bibliographic entry see Field 05B.
W73-03669

APPLICATION OF THE MATHEMATICAL SIMULATION METHOD TO THE STUDY OF THE ROLE OF PHOTOSYNTHETIC AERATION OF LAKES,
Akademiya Nuak SSSR, Moscow. Inst. of Evolutionary Physiology.
A. A. Umnov.
The Soviet Journal of Ecology, Vol 2, No 6, p 489-494, November-December, 1971, 5 fig, 6 ref. Trans. from Ekologiya, No 6, p 5-12, Nov-Dec 1971.

Descriptors: *Mathematical models, *Self-purification, *Oxygen demand, Ecosystems, *Photosynthesis, Computer models, Reservoirs, *Simulation analysis.
Identifiers: *Computer simulation.

A mathematical model of the lake ecosystems was realized on a digital computer, the fundamental laws governing the dynamics of oxygen dissolution forming its basis. The results of simulation demonstrate the usefulness of the model for describing the dynamics of oxygen transfer in a water body and indicate the decisive role of photosynthesis in oxygen enrichment of the water. Despite the inevitable simplification in model construction, predictions adequately describe the basic mechanisms of self-purification in a reservoir. (Anderson-Texas)
W73-03689

THE RELATIONSHIP BETWEEN MOISTURE CONTENT AND NET ASSIMILATION RATE OF LICHEN THALLI AND ITS ECOLOGICAL SIGNIFICANCE,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
K. A. Kershaw.
Can J Bot. Vol 50, No 3, p 543-555. 1972. Illus.
Identifiers: *Plant physiology, Assimilation, Carbon dioxide, Ecology, Habitats, *Lichen, Moisture, Peltigera praetextata, Rates, Relationships, Thalli, Umbilicaria mammulata.

The relationship between net assimilation rates and percentage thallus saturation was investigated in 12 widely occurring lichen species in southern Ontario. Optimum net assimilation rates occur between 35 and 70% of thallus saturation levels for different species. A close relationship has been shown to exist between their ecology and the percentage saturation at which maximum assimilation occurs. Optimum net assimilation rate values range from 0.03 mg CO2/g dry weight in Umbilicaria mammulata up to 0.11 mg CO2/g dry weight in Peltigera praetextata. Five of the species also exhibit a plastic physiology in that maximum net assimilation occurs at different levels of thallus saturation in replicates collected from different microhabitats. The implications of this variability are briefly discussed.–Copyright 1972, Biological Abstracts, Inc.
W73-03708

EFFECTS OF SHORT PERIODS OF ANAEROBIC AND NEAR-ANAEROBIC CONDITIONS ON WATER UPTAKE BY TOBACCO ROOTS,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
C. R. Willey.
Agronomy Journal, Vol 62, No 2, p 224-229, 1970. 2 tab, 9 fig, 19 ref.

Descriptors: Drainage, *Aeration, *Tobacco, *Absorption, Roots, *Anaerobic conditions.
Identifiers: *Root respiration, Anaerobic treatment.

Intact tobacco roots growing in nutrient solution spray in a sealed chamber were treated with mixtures of O2, N2, and CO2 gases. Oxygen and water uptake by roots and plant stem diameter were recorded. Anaerobic treatments produced by flushing roots with N2, or N2 plus 21 percent CO2 gases for 6 hours decreased water uptake 50 percent or more, but restoration of air to roots caused a rapid recovery of water uptake. Root injury was caused by both treatments as evidenced by reduced oxygen uptake following each treatment. Gases with 1 percent or more oxygen had little or no effect on water uptake. Treatment gases containing up to 21 percent CO2 had the same effect on water uptake as treatment gases without CO2. Oxygen deficiency appears to be the primary cause of the initial decrease in water uptake and wilting of tobacco subjected to poor root aeration. (Skogerboe - Colorado State)
W73-03761

RESPONSE OF COTTON TO BORON,
Mississippi Agricultural and Forestry Experiment Station, State College.
For primary bibliographic entry see Field 03F.
W73-03799

DISTRIBUTION OF INFECTIOUS HEPATITIS IN DERBENT (IN RUSSIAN),
G. V. Sultanov.
Sov Med. Vol 34, No 5, p 147-149. 1971.
Identifiers: *Public health, *Diseases, Derbent, Distribution, Infectious hepatitis, USSR.

The incidence of infectious hepatitis in the Derbent region is year-round, but has seasonal rises most observable in children and coinciding with the availability of water to play in (e.g. irrigation canals). Incidence was higher among children not institutionalized. Distribution characteristics confirm the dominant role of the fecal-oral mechanism in transmission of the disease, in which water plays a basic role. The coefficient of focalization was low (1.1%). A wide dissemination of the infection in the form of isolated cases (97.2%) was noted, with the source of the infection usually not ascertainable.—Copyright 1972, Biological Abstracts, Inc.
W73-03803

AN IN VIVO STUDY ON ENAMEL FLUORIDE IN CHILDREN LIVING IN A FLUORIDATED AND IN A NONFLUORIDATED AREA,
Forsyth Dental Center, Boston, Mass.
R. Aasenden, M. Allukian, F. Brudevold, and W. D. Wellock.
Arch Oral Biol. Vol 16, No 12, p 1399-1411. 1971. Illus.
Identifiers: *Public health, Fluoridation, Children, Dentifrice, Enamel, *Fluorides, Massachusetts.

Fluoride was determined in intact surface enamel from 3 tooth types in 9-11 yr old continuous residents of the communities of Salem (water F: 1 ppm) and Hyannis (water F<0.1 ppm) in Massachusetts. The mean F concentrations of central incisors at the approximate depth of 0.5 micrometer were 3000 ppm and 2100 ppm in Salen and Hyannis, respectively. The concentrations decreased by about 1000 ppm over the subsequent 1.5 micrometer depth interval. Comparisons between the 2 populations on the basis of lateral incisors and of first molars yielded similar results. The findings also indicated that differences within a mouth between various tooth types were fairly small. There was a marked individual variation within each population. In Salem, the F levels of enamel in males were significantly higher than in females. A similar trend was found in Hyannis. No elevation of enamel F shortly after the use of an F dentifrice could be shown.—Copyright 1972, Biological Abstracts, Inc.
W73-03805

SAPROBIOLOGICAL RESEARCH IN THE JIU RIVER BASIN (IN RUSSIAN),
Laboratorul de Hidrobiologia, Craiova (Rumania).
A. Mihaita.
An Univ Bucur Biol Anim. 19. p 101-107. 1970. Illus.
Identifiers: *Water purity, Basins, *Jiu River, Water pollution, Romania, Water pollution effects.

Biological research conducted on the Jiu River (Romania) showed that in the natural zones, the biological table is represented by organisms sensitive to water quality. Below the Lupeni and Petrila coal mining areas, pollution has deeply altered the chemical and biological composition of the water. By the benthic organisms and biocoenoses found, the degree of water purity was calculated.—Copyright 1972, Biological Abstracts, Inc.
W73-03860

BIOLOGICAL STUDIES ON THE WATER OF THE MOTRU RIVER BASIN (IN RUSSIAN),
Bucharest Univ. (Rumania).
A. Mihaita.
An Univ Bucur Biol Anim. 19. p 89-100. 1970. Illus.
Identifiers: *Water quality, Basins, Biology, *Motru River, Organisms, Water pollution, Romania.

Biological research was conducted on the Motru River and 2 of its tributaries, the Cosustea and Bulba. Pollution was slight and had not modified the chemical and biological composition of the water. The biological table was represented by organisms sensitive to water quality, and the degrees of water purity were calculated using the benthic organisms and biocoenoses found. A table is given indicating the distribution of benthic organisms in the sampling stations. The upstream species corresponded to oligosaprobes and the downstream ones to mesosaprobes.—Copyright 1972, Biological Abstracts, Inc.
W73-03861

PREDICTION OF BALANCE OF MATTER IN STORAGE RESERVOIRS BY MEANS OF CONTINUOUS OR SEMICONTINUOUS BIOLOGICAL MODELS: I. BASES (IN GERMAN),
Technische Universitaet, Dresden (East Germany).
D. Uhlmann, J. Benndorf, and W. Albert.
Int Rev Gesamten Hydrobiol. Vol 56, No 4, p 513-539. 1971. English summary.
Identifiers: Balance, Bases, Biology, *Biomass, Matter, *Model studies, Orthophosphate, Phytoplankton, Prediction, Reservoir storage, Sewage.

It is desirable to be able to predict the effect of preimpoundment basins in the construction of new reservoirs. By passage of water from the natural drainage through semicontinuous flow models under natural light conditions (in greenhouses) and under different temperature regimes, it was possible to determine the growth rate of natural mixed phytoplankton, and also the removal of plant nutrients (orthophosphate). Various concentrations of plant nutrients or of dilute sewage wastes were used. Output of biomass decreased exponentially from 1 stage to the next, whereas the specific activity of the microbial biomass increased. The detention time required for removal of 70% of the chemical O2 demand varied from 1 to 3.5 days. Orthophosphate removal was very slow below the critical detention time, whereas only a little above it, 70-90% of the orthophosphate was removed. Longer detention times did not improve the degree of removal of orthophosphate. A test of the method was made by predicting the phytoplankton growth and the removal rate of orthophosphate in the preimpoundment basins of the Weida drinking water reservoir. A removal of 70-90% of the orthophosphate was predicted with a detention time greater than 1 day. This was in close agreement with field studies of the Weida reservoir.—Copyright 1972, Biological Abstracts, Inc.
W73-03862

OBSERVATION OF A PHENOMENON OF RED TIDE IN THE BAY OF VALPARAISO (IN SPANISH),
Chile Univ., Vina del Mar. Departamento de Oceanologia.
S. Avaria.
Rev Biol Mar. Vol 14, No 1, p 1-5. 1970. Illus. English summary.
Identifiers: *Bay of Valparaiso, Chile, Cyclotrichium-Meunieri, *Red tide, *Ciliates.

A red-tide caused by the ciliate Cyclotrichium meunieri Powers in waters of the Valparaiso Bay is described. The very uncommon phenomenon for this area appeared during a period when water temperature was rather high and preceded by a long period of insolation without winds. An historical survey of the red-tide phenomenon recorded at the Chilean coast is presented as well as a bibliographical review of water discoloration caused by ciliates in the whole world.—Copyright 1972, Biological Abstracts, Inc.
W73-03870

EFFECTS OF SOME RESPIRATORY INHIBITORS ON WATER FLUX IN ROOT HAIRS OF AVENA SATIVA,
Montreal Univ. (Quebec). Dept. of Biological Sciences.
For primary bibliographic entry see Field 02I.
W73-03893

5D. Waste Treatment Processes

TREATMENT AND CONTROL OF PETROLEUM AND PETROCHEMICAL WASTES - ROBERT S. KERR WATER RESEARCH CENTER,
Robert S. Kerr Water Research Center, Ada, Okla.
William C. Galegar, and James A. Horn.
Available from the National Technical Information Service as PB-213 844, $3.00 in paper copy, $0.95 in microfiche. Paper presented at the 159th National American Chemical Society Meeting, Houston, Texas, 2/26/70 February 26, 1970. 13 p. EPA Program 12020--02/70.

Descriptors: *Research and development, *Chemical wastes, *Oil industry, Treatment, Control, Oil wastes, Waste water treatment, Pollution abatement.

The organizational structure and research functions of the Robert S. Kerr Water Research Center, a field laboratory of the Office of Research and Monitoring, Environmental Protection Agency are described. Intramural and extramural research projects related to treatment and control of petroleum and petrochemical wastes are discussed. Future program activities related to these industries also are discussed. A 6-page paper, 'Petrochemical Waste Research Needs,' by Engineering-Science, Inc./Texas is attached.

W73-03251

LAND OUTLEASE FOR WASTEWATER TREATMENT FACILITIES, TYNDALL AIR FORCE BASE, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of the Air Force, Washington, D.C.

Available from the National Technical Information Service as EIS-FL-72-5015-F, $12.00 in paper copy, $0.95 in microfiche. July 1972. 197 p, 10 fig, 14 maps, 3 tab, 12 append.

Descriptors: *Environmental effects, *Sewage lagoons, *Florida, *Water treatment, *Waste water treatment, Water pollution, Aeration, Water quality, Discharge (Water), Fluorides, Inorganic compounds, Halides, Chlorides, Turbidity, Nutrients, Effluents, Treatment facilities, Pretreatment (Water), Water treatment, Gulf coastal plain, Water quality standards, Organic wastes, Pumping plants.
Identifiers: *Environmental Impact Statements, Tyndall Air Force Base (Fla).

The proposed action is to outlease 150 acres of land on Tyndall AFB, Florida, in the area of Military Point, to Bay County, Florida. The land will be used for construction and operation of secondary wastewater treatment facilities for four municipalities and two industries. The environmental impact involves discharge of treated wastewater to Class III waters of St. Andrew Bay, complying with current state standards. This upgrades current primary treated industrial waste effluent and the septic tank treatment for domestic waste. Adverse impact on the immediate Military Point area will result from change in land use from the natural state to a sewage lagoon and the resultant loss of use and production of forests, fish and wildlife, and recreation. There will be no significant adverse effect on the overall environment of Bay County. Alternatives considered included: (1) location at other Bay County sites, (2) location on International Paper Company plant site, (3) separate regional system for domestic waste with treatment facility at some other county site, (4) use of other treatment processes, (5) spray effluent disposal, and (6) Gulf discharge. Copies of this statement have been made available to interested agencies. (Tolle-Florida)
W73-03353

ELECTROCHEMICAL TREATMENT OF LIQUIDS,
Norton Co., Troy, N.Y. (assignee).
S. Eisner.
U. S. Patent No. 3,619,391, 4 p, 3 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 892, No 2, p 705, November 9, 1971.

Descriptors: *Patents, *Liquid wastes, *Electric currents, *Electrochemistry, Pollution abatement, Abatement, *Industrial wastes, Treatment, Water quality control, *Waste water treatment, Water pollution treatment.
Identifiers: *Cyanide.

The process consists of bringing the liquids into contact with metallic electrodes, passing an electric current between the electrodes and through the liquid, and at the same time mechanically activating the surface of the electrodes with small particles to speed up the electrochemical reaction. The compound added to the liquid between the electrodes decomposes and its products react with organic and inorganic substances in the liquid. The positive electrode is a corrodible metallic material whereby colloidal substances containing metallic hydroxide are produced. (Sinha-OEIS)
W73-03364

LIQUID-TREATING APPARATUS,
Ethyl Corp., New York. (assignee).
J. H. Benton, and J. A. Self.
U. S. Patent No. 3,618,778, 3 p, 13 fig, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 892, No 2, p 576, November 9, 1971.

Descriptors: *Patents, *Aerobic treatment, *Bacteria, *Aerobic bacteria, *Waste water treatment, *Liquid wastes, Water quality control, Water pollution control, Water quality, Equipment, *Polymers, *Filters, Filtration.

The apparatus consists of a filter module made of alternate flat and corrugated sheets of a thermoplastic material (a polyvinyl chloride homopolymer). A large surface area is provided for the growth of bacteria. (Sinha-OEIS)
W73-03365

FILTERING AND CONCENTRATING MEANS AND METHOD,
E. W. Smith.
U. S. Patent No. 3,617,543, 4 p, 2 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 892, No 1, p 251, November 2, 1971.

Descriptors: *Patents, *Waste water treatment, *Liquid wastes, *Filtration, Equipment, Abatement, Pollution abatement, *Industrial wastes, *Filters, Water pollution control, Water quality control, Water pollution, Water quality, Water treatment.

The apparatus for filtering and/or concentrating mixtures of liquids and particles has an encircling or tubular filter screen mounted about an axis for torsional oscillation. A first liquid flow is set up into the screen with a second liquid flow being established out of the screen with the second flow having peak magnitudes greater than the first flow. A torsional oscillation shearing force is set up between the filter screen and the liquid. This force prevents the particle build up which might otherwise clog the screen. (Sinha-OEIS)
W73-03367

WASTE TREATMENT AND DISPOSAL SYSTEM,
Standard Products Co., Cleveland, Ohio. (assignee).
M. L. Dieterich.
U. S. Patent No. 3,612,278, 3 p, 5 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 891, No 2, p 661, October 12, 1971.

Descriptors: *Patents, *Waste disposal, *Waste water treatment, Abatement, Pollution abatement, Water quality control, Water pollution control, Water quality, Water pollution.
Identifiers: Vehicular units, Antifoaming agents, Deodorants.

This system incorporates a peristaltic pump for transmitting the liquid effluent from the septic tank to the vaporization chamber. The pump uses concentric tubes which define two or more separate flow paths. Chemical agents, such as antifoaming agents or deodorants may be introduced and intermixed with the liquid effluent prior to admission to the vaporization chamber. The system is particularly adaptable for use in vehicles for human transportation. (Sinha-OEIS)
W73-03369

AERATOR IMPELLERS FOR THE AERATION OF LIQUIDS,
J. R. Kaelin.
U. S. Patent No. 3,610,590, 4 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 891, No 1, p 220, October 5, 1971.

Descriptors: *Patents, *Waste water treatment, *Aeration, *Rotors, Sewage treatment, Equipment, Pollution abatement, Abatement, Water pollution control, Water quality control, Water pollution treatment, Water pollution.
Identifiers: *Aerator impellers.

This vertical axis aeration impeller comprises a rotor body which has an inverted frustoconical-shape. The outer side of the rotor is provided with blades which extend from the suction side to the delivery side. The yoke of the T-shaped profile of the blades is placed on the web of the profile to form an angle of incidence with it. The free edges of the flanges of circumferentially adjacent blades are spaced from each other to provide laterally open flow channels for the liquid which remains in contact with air. (Sinha-OEIS)
W73-03370

METHOD AND COMPOSITION FOR PHOSPHATE REMOVAL,
W. C. Steigerwald, Jr.
U.S. Patent No 3,607,742, 4 p, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1231, September 21, 1971.

Descriptors: *Patents, *Industrial wastes, Phosphates, *Nutrient removal, *Waste water treatment, Water quality, Water quality control, Water pollution, Water pollution control, Water pollution treatment.
Identifiers: Chemical treatment.

The substance to be used in the removal of phosphate from raw sewage or waste consists of a solution of sodium hydroxide, aluminum hydrate, unmodified starch and water. The method involves mixing with agitation about 24-30 grams of the caustic soda, about 24-30 grams of the aluminum hydrate and about 1-4 grams of the unmodified starch with water to produce a 100-gram solution. The mixture is heated to approximately 225F, then cooled to approximately 125F, and then agitated to form a homogeneous solution. (Sinha-OEIS)
W73-03374

METHOD OF TREATING ORGANIC WASTE WATER,
Kurita Water Industries Ltd., Osaka (Japan) (assignee).
M. Yusho.
U.S. Patent No 3,607,736, 4 p, 2 fig, 2 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1229, September 21, 1971.

Descriptors: *Patents, *Organic wastes, Domestic wastes, Liquid wastes, *Waste water treatment, *Activated sludge, *Denitrification, Nitrates, Nitrites, Water pollution, Water pollution treatment, Water pollution control, Water quality, Water quality control, Bacteria, *Anaerobic bacteria, Oxygen.

Activated sludge containing denitrifying bacteria are brought into contact with raw organic waste water in the presence of nitrate or nitrite ions. The mixture is held in an anaerobic state to reduce the nitrate or nitrite and utilize the resultant chemical oxygen to decompose the organic water. (Sinha-OEIS)
W73-03377

PURIFICATION OF AQUEOUS MEDIA BY REMOVAL OF PHENOLIC AND METAL CONTAMINANTS THEREFROM,
Monsanto Co., St. Louis, Mo. (assignee).
K. Landenburg, B. W. Weinrick, and J. H. Johnson.
U.S. Patent No 3,597,351, 10 p, 4 tab, 10 ref; Official Gazette of the United States Patent Office, Vol 889, No 1, p 254, August 3, 1971.

Descriptors: *Patents, *Polymers, *Phenols, *Metals, *Industrial wastes, *Chemical wastes, Abatement, Pollution abatement, Water pollution, Water pollution treatment, Water pollution control, Water quality, Water quality control, *Waste water treatment.
Identifiers: Tannins.

Certain basic polymeric compositions are used for the removal of phenolic components and metal ion contaminants present in low concentrations in water. When applied to treatment of industrial waste effluent, the process provides for sorption and optional recovery of metals and valuable phenolic components, including tannins. (Sinha-OEIS)
W73-03382

DEVICES FOR CLEANSING THE BILGE WATER AND THE LIKE IN WATERCRAFT,
R. C. Dyer.
U.S. Patent No 3,589,608, 2 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 887, No 6, p 2016, June 29, 1971.

Descriptors: *Patents, *Waste water treatment, Equipment, Treatment, Pollution abatement, Abatement, Water pollution control, Water quality control, *Sewage treatment, *Microorganisms, Ships.
Identifiers: Dichlorophen, *Chemical treatment, *Bilge water.

A container charged with an antimicrobial compound, as for example, dichlorophen, when inserted into ships bilge water will cause the compound to be dispersed into the water. The container is made of a material having pores through which water may move to contact the antimicrobial agent which is present as a solid and remains within the container. (Sinha-OEIS)
W73-03383

MECHANISM AND METHOD FOR A CHAR--RECYCLING COUNTERFLOW WATER CLARIFIER,
A. J. Shaler, and D. C. McLean.
U.S. Patent No 3,622,509, 6 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 892, No 4, p 1448, November 23, 1971.

Descriptors: *Patents, *Waste water treatment, *Clarification, Water purification, *Filtration, Pollution abatement, *Industrial wastes, *Sewage treatment, *Municipal wastes, Water pollution control, Water quality control, Water quality, Incineration, Burning.

A portion of the pollutant material is mechanically removed and burned to provide heat which is used to form char from another portion of the pollutant material. The char is then mixed with the polluted tail waters from the removing operation and is agitated and heated by gases of combustion from the burning to adsorb remaining pollutants and to purify and cool the gases. The purified water is filtered from the spent char and purified gases are vented to the atmosphere. (Sinha-OEIS)
W73-03384

SLUDGE DISPOSAL,
Komline-Sanderson Engineering Corp., Peapack, N.J. (assignee).
T. R. Komline.
U.S. Patent No 3,622,508, 4 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 892, No 4, p 1448, November 23, 1971.

Descriptors: *Patents, *Sewage treatment, *Aeration, *Flocculation, Water quality control, Water pollution control, Water pollution, Water quality, *Aerobic treatment, *Waste water treatment, Pollution abatement, *Sludge disposal.
Identifiers: Primary sludge, Secondary sludge.

Sewage is subjected to sequential treatments. Primary sludge is concentrated by dewatering on a filter unit to form a solid filter cake of relatively low moisture content. The secondary sludge is concentrated by flotation and the concentrated sludges are then blended into a liquid slurry which is discharged as a fine spray for drying and incineration. The primary sludge is subjected to treatment by a flocculating agent while the secondary sludge is treated by different flocculating agents. (Sinha-OEIS)
W73-03385

AEROBIC WASTE TREATMENT SYSTEM WITH AUTOMATIC BACK FLUSHING FILTER,
Aquanox, Inc., Fort Lee, N.J. (assignee).
Joe M. Valdespino.
U.S. Patent No 3,620,371, 4 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 892, No 3, p 955, November 16, 1971.

Descriptors: *Patents, *Aerobic treatment, *Waste water treatment, *Aeration, *Chlorination, Equipment, Filters, Pollution abatement, Abatement, Water quality control, Water pollution control, Water pollution treatment.

The system consists of a hydraulic comminuting-reaeration tank connected to a vacuum aeration tank by a siphon and having a pump for positive recirculation to an aspirator. Effluent from the vacuum aeration tank is taken off into an automatic back flushing filter having a vacuum connection to one side and a closed air connection to the other side of a filter screen. The air connection is opened periodically and the vacuum sucks in a pulse of air against the flow of liquid flushing the accumulated solids on the filter screen back into the aeration tank. There is a pneumatic ejection system and an automatic chlorination system. (Sinha-OEIS)
W73-03386

SEWAGE TREATMENT PROCESS,
Nalco Chemical Co., Chicago, Ill. (assignee).
F. N. Kemmer, R. S. Robertson, and R. D. Mattix.
U.S. Patent No 3,619,420, 5 p, 1 fig, 8 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 892, No 2, p 710, November 9, 1971.

Descriptors: *Patents, *Sewage treatment, Pollution abatement, Treatment, Abatement, *Liquid wastes, *Waste water treatment, Water pollution control, Water quality control, *Activated sludge, *Acids.

A method is provided for improving the operational efficiency of sewage treatment plants whereby at least a portion of the sludge produced by such plants is converted into an active substance. A portion of the active substance is then used as a water-treating aid to improve the overall quality of the waste effluent waters. After adding from 0.1 percent to 50 percent of an acidic conditioning agent selected from the group consisting of HCl and gaseous HCl to the dewater sludge, it is heated at a temperature from 300 to 900C from 3 to 200 min at a pressure of one atmosphere absolute. (Sinha-OEIS)
W73-03387

STORM SEWAGE TREATMENT,
Underwater Storage, Inc., Washington, D.C. (assignee).
H. G. Quase.
U.S. Patent No 3,674,687, 4 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 900, No 1, p 266, July 4, 1972.

Descriptors: *Patents, *Aerobic bacteria, *Aerobic treatment, *Sewage treatment, *Storm runoff, Runoff, *Aeration, Abatement, Pollution abatement, Water quality, Water quality control, Water pollution, Water pollution control, *Waste water treatment.
Identifiers: Storm sewage, Street runoff.

Solids are removed from street runoff or storm sewage when passed through a grit chamber and screen. The fluid is pumped into large temporary storage tanks which are submerged in a body of water. Air is continually bubbled upward through the tanks. When excess runoff has ceased, the storm sewage is pumped from the temporary storage tanks and purified before releasing it into a permanent dispersion media. (Sinha-OEIS)
W73-03392

APPARATUS USED IN PURIFYING WASTE WATER,
Standard Oil Co. (Indiana), Chicago, Ill. (assignee).
J. F. Grutsch, and R. C. Mallatt.
U.S. Patent No 3,675,779, 5 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 900, No 2, p 551, July 11, 1972.

Descriptors: *Patents, Oily water, *Oil wastes, Oil pollution, Abatement, Equipment, Pollution abatement, *Waste water treatment, *Industrial wastes, *Aerobic treatment, *Aeration, Microorganisms, Water quality control, Water quality, Water pollution, Water pollution control, Lagoons.
Identifiers: Oil refinery wastes.

The system includes lagoons in which aerobic microorganisms will thrive. The oil refinery waste water flows through the lagoons where it is aerated. A mobile aerator moves across the surface, churning the surface and introducing air into the body of waste water. Underwater turbulence scours the lagoon's bottom controlling the deposition of sludge. (Sinha-OEIS)
W73-03394

AIR DIFFUSION APPARATUS FOR THE TREATMENT OF POLLUTED WATER,
M. W. Smith.
U.S. Patent No 3,679,187, 3 p, 8 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 900, No 4, p 1404, July 25, 1972.

Descriptors: *Patents, *Aeration, *Waste water treatment, Water purification, Bubbles, Water pollution, Water pollution control, Water pollution treatment, Water quality, Water quality control.

Vertical air diffusion units are placed so that they supply air to waste water. Each unit consists of a vertical open-bottom injection pipe which extends downward into the waste water tank. The individual orifice fittings are preset. The lower discharge extremities of the pipes, being vertically slotted, circumferentially distribute the discharging air and being provided with bubble deflectors above the slots distribute and break up the coarse air bubbles arising from open slots. (Sinha-OEIS)
W73-03395

WATER TREATMENT,
Taulman Co., Atlanta, Ga. (assignee).
E. F. Morey.
U.S. Patent No 3,618,766, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 892, No 2, p 573, November 9, 1971.

Descriptors: *Patents, Water treatment, *Waste water treatment, Filters, *Filtration, Abatement, Pollution abatement, Water pollution control, Water quality control, Water pollution, Water quality.
Identifiers: *Hydrophilic substances, *Hydroxyl, *Amine carboxyl.

A method is described for controlling the addition of filter aid chemicals to a filtration system wherein the turbidity of water passing through the system is observed at a point intermediate through the filter media. The filter aids generally comprise sticky, colloidal, organic compounds of relatively high molecular weight and which bear numerous hydrophilic constituents such as hydroxyl, amine carboxyl, or amide groups. (Sinha-OEIS)
W73-03396

SEWAGE TREATMENT PROCESS AND APPARATUS,
FMC Corp., San Jose, Calif. (assignee).
M. F. Hobbs, R. W. Prettyman, J. H. Blake, and R. A. Fisher.
U.S. Patent No 3,619,421, 4 p, 6 ref; Official Gazette of the United States Patent Office, Vol 892, No 2, p 710, November 9, 1971.

Descriptors: *Patents, *Sewage treatment, Liquid wastes, Equipment, Treatment, Abatement, Pollution abatement, *Aeration, *Aerobic treatment, Water pollution control, Water quality control, Water quality, *Waste water treatment.

An invention provides for the control of air dispersion in the aeration tank of a sewage treatment plant using the cross flow arrangement of the activated sludge process to accomplish homogeneous mixing. The liquid wastes are introduced into the aeration zone in positions subject to the effects of tank agitation and are brought to the stage of a homogeneous mixture. (Sinha-OEIS)
W73-03397

WATER PURIFICATION APPARATUS,
S. Jacquet.
U.S. Patent No 3,618,773, 4 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 892, No 2, p 575, November 9, 1971.

Descriptors: *Patents, *Water purification, *Water treatment, *Waste water treatment, Abatement, Pollution abatement, Equipment, Water quality, Water quality control, Water pollution, Water pollution treatment, Water pollution control.

This invention provides for floating or otherwise suspending one or more basins formed of supple nonporous material in a body of water. The contaminated water is delivered into the flexible walled basin or basins where the purification process is carried out. The sediment collects in the bottom of the basins, and treated clear water flows from the upper levels into the body of water in which the basins are suspended. (Sinha-OEIS)
W73-03398

WATER AND WASTEWATER RESEARCH IN SAN DIEGO,
San Diego Dept. of Utilities, Calif.
For primary bibliographic entry see Field 05F.
W73-03454

DRINKING WATER FROM SEWAGE,
Gruenwald Associates, Long Island City, N.Y.
For primary bibliographic entry see Field 05F.
W73-03457

LET'S UPDATE FILTER-DESIGN STANDARDS,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 05F.
W73-03458

CONTROL TECHNIQUES FOR COAGULATION-FILTRATION,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. Cincinnati Water Research Lab.
For primary bibliographic entry see Field 05F.
W73-03459

OZONATION TODAY,
Water Treatment Corp. City of Industry, Calif.
For primary bibliographic entry see Field 05F.
W73-03482

DESALINATION OF AGRICULTURAL TILE DRAINAGE.
Robert S. Kerr Water Research Center, Ada, Okla.
Copy available from GPO Sup Doc as EP1.16:13030 ELY 05/71-12, $1.00; microfiche from NTIS as PB-213 890, $0.95. Water Pollution Control Research Series, May 1971. 32 p, 13 fig, 6 tab, 6 ref.

Descriptors: *Desalination, *Irrigation waters, *Return flow, Reverse osmosis, Electrodialysis, Salinity, Nitrate, Boron, Tile drains, *Waste water treatment.
Identifiers: *San Joaquin Valley (Calif).

Investigations were made to determine the technical feasibility of desalination of tile drainage. The source of the tile drainage was a 400-acre field near Firebaugh, California. Reverse Osmosis (RO) and Electrodialysis (ED) processes were studied. Two RO membrane stacks were investigated. The first, a high salt rejection, low product yield, was operated on variable quality (3000-7000 mg/l TDS) irrigation return water. In the 7-month investigation period TDS removal efficiencies decreased from 93 percent to 80 percent salt rejection and the product flux decreased from 12 gal/ft2/day to less than 9 gal/ft2/day. The 20 mg/l of nitrate-nitrogen and 8 mg/l of boron contained in the influent were not effectively rejected. The second RO stack and also the ED unit were operated on return waters that were controlled to have a 3000 mg/l TDS. The second RO stack was designed for a high product rate and low salt rejection. The TDS removal remained at 85 percent for a 3-month run. Product flux decreased from over 19 gal/ft2/day to less than 12 gal/ft2/day. Nitrate and boron rejection was low. The ED data are based on a single pass through the membrane stack. The TDS removal varied from 35 percent to 15 percent. The nitrate removal rate was greater than the TDS removal. Boron removal was negligible. It is estimated that the costs for the two processes are approximately equal--$320 per million gallons of product.
W73-03501

THE EFFECTS OF AGRICULTURAL WASTE WATER TREATMENT ON ALGAL BIOASSAY RESPONSE,
Environmental Protection Agency, San Francisco, Calif. Region X.
For primary bibliographic entry see Field 05C.
W73-03502

PHOTOCHEMICAL METHODS FOR PURIFYING WATER,
Environmental Protection Agency, Cincinnati, Ohio.
C. Y. Cha, and J. M. Smith.
Copy available from GPO Sup Doc as EP1.23/2:72-104, $0.70; microfiche from NTIS as PB-214 099, $0.95. Environmental Protection Agency report EPA-R2-72-104, November 1972. 29 p, 4 fig, 1 tab, 6 ref. EPA Project 17020 EVQ.

Descriptors: *Oxidation, *Photoactivation, Sewage treatment, Waste treatment, *Waste water treatment, *Tertiary treatment, Water pollution treatment, Chemical degradation, Chlorine, Chlorination, Kinetics, Organic matter, Organic wastes, *California.
Identifiers: *Photochemical oxidation, Sewage oxidation, Chlorine-sensitized oxidation, Photooxidation, Chemical oxidation, Oxidation kinetics, *Sacramento (Calif).

The kinetics of photochemical oxidation of organic carbon pollutants, with and without sensitization by chlorine, have been determined. The results, which are suitable for use in designing reactors for any type of lamp and lamp-reactor geometry, are based upon data obtained for secondary effluents from Sacramento area municipal treatment plants. A trough reactor with parabolic reflector was the most suitable design for a large-scale, tertiary treatment plant based upon photochemical oxidation. Cost calculations were made for reducing the TOC from 10 to 4 mg/liter and maintaining a chlorine concentration of about 0.8 mg/liter. For a capacity of one-million gallons per day of secondary effluent, treatment costs were 89 cents per 1000 gallons with a total plant investment of $563,000. (EPA abstract)
W73-03505

FULL SCALE PARALLEL ACTIVATED SLUDGE PROCESS EVALUATION,
National Environmental Research Center, Cincinnati.
Erwin D. Toerber.
Copy available from GPO Sup Doc as EP1.23/2:72-065, $2.75; microfiche from NTIS as PB-213 928, $0.95. Environmental Protection Agency report EPA-R2-72-065, November 1972. 203 p, 82 fig, 34 tab, 16 ref, append. EPA Project 17050 ENM.

Descriptors: *Activated sludge, *Biological treatment, Capital costs, Water pollution control, *Waste water treatment, *Sewage treatment, Computer simulation, *Illinois, Mixing.
Identifiers: Complete-mix, Plug-flow, Tracer tests, Shock loads, *Freeport (Ill), Treatment plant design.

A comparison was made between parallel activated sludge systems operating under completely-mixed and plug-flow modes. Initially, a rhodamine dye tracer study was conducted to determine conditions necessary to achieve the two operational modes. The completely-mixed system was operated at 5 constant detention times ranging from 5 hours to 1 hour. The break in treatment efficiency (a marked drop below 90% removal of soluble BOD5) occurred between 1 and 2 hours. No marked difference in treatment efficiency was found between the two modes during 5 months of the parallel operation. Two methods of solids production analysis were applied to the data. A series of oxygen uptake tests were performed to evaluate air requirements. Finally, a set of shock loads were applied in parallel and separately to each mode. The complete-mix system did show an advantage over plug-flow under shock load conditions at a short detention time (1.5 hours). A 500 gpd completely-mixed pilot plant was run in parallel with the full scale system for 4 months. It was most successful in duplicating the full scale organic removal efficiency. (EPA abstract)
W73-03510

INITIAL MIXING IN COAGULATION PROCESSES,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05F.
W73-03511

AN INVESTIGATION OF PHOSPHORUS REMOVAL MECHANISMS IN ACTIVATED SLUDGE SYSTEMS,
National Environmental Research Center, Cincinnati, Ohio.
W. E. Morgan, and E. G. Fruh.
Copy available from GPO Sup Doc as EP1.23/2.72-031, $2.00; microfiche from NTIS as PB-213 893, $0.95. Environmental Protection Agency report EPA-R2-72-031, November 1972. 146 p, 33 fig, 22 tab, 62 ref, 3 append. EPA Project 17010 DUX.

Descriptors: *Waste water treatment, *Phosphorus, Nutrient requirements, *Enzyme, *Bioassay, Chemical precipitation, *Calcium, Magnesium, Fluoride, Alkalinity, *Activated sludge, *Metabolism.
Identifiers: Phosphorus removal, Metabolic uptake, Luxury uptake, Calcium-phosphorus precipitation.

The magnitude of two phosphorus removal mechanisms, metabolic uptake and chemical precipitation with calcium, in activated sludge systems were investigated using synthetic sub-

strates representative of actual wastewaters. Using completely mixed continuous flow laboratory activated sludge units with operating conditions that precluded significant precipitation of phosphorus, normal growth defined as constant 85 to 90 percent carbon removal occurred above 0.9 to 1.0 percent sludge phosphorus (influent COD:P ratio of 670:1). Between 1.0 and 1.6 percent (influent COD:P ratio of 220:1) a storage zone existed with all phosphorus present utilized, and above 1.6 percent a variable saturation zone occurred with an upper limit near 3.0 percent. An alkaline phosphatase bioassay verified qualitatively the normal growth phosphorus requirement and storage zone, but did not define the upper limit of the saturation zone. An acclimated activated sludge unit with a substrate contining 2 mM calcium, 0.4 mM phosphorus, 0.8 mM magnesium and 2.5 mM bicarbonate attained a maximum of 3.7 percent sludge phosphorus after 39 days of operation at pH 7.6. A similar system with the addition of 1 mg/l fluoride attained 4.6 percent sludge phosphorus. An increase in magnesium to 2.0 mM had little effect on phosphorus precipitation. Alkalinity was implicated to exert both a kinetic effect as well as an effect on residual soluble phosphorus in calcium-phosphorus systems. The presence of soluble organics also was shown to be inhibiting with increasing concentrations. (EPA abstract)
W73-03512

STORAGE AND TREATMENT OF COMBINED SEWER OVERFLOWS.
Environmental Protection Agency, Minneapolis, Minn. Lake Superior Basin Office.

Copy available from GPO Sup Doc as EP1.23/272-070, $2.00; microfiche from NTIS as PB-214 106, $4.00, PC$0.95. Environmental Protection Agency report EPA-R2-72-070, October 1972. 122 p, 27 fig, 17 tab, 4 ref, append. EPA Project 11023 FIY.

Descriptors: *Overflow, Rainfall-runoff relationships, *Sewage treatment, *Storm runoff, *Waste storage, Activated sludge, Capital costs, Design storm, Maintenance costs, Operating costs, Precipitation intensity, Sedimentation, Sewage, Water quality, *Wisconsin, Waste water treatment.
Identifiers: *Combined sewers, *Detention ponds, *Chippewa River (Wis).

The objective of this study was to demonstrate the feasibility and economic effectiveness of a combined wastewater overflow detention basin. A paved asphalt detention basin with a storage volume of 8.66 acre feet was constructed at Chippewa Falls, Wisconsin to receive overflow from a 90 acre combined sewer area including all of the central business district. The system was designed so that the stored combined sewage could be pumped to the wastewater treatment plant when precipitation subsided. During 1969, due to dry weather, the pond received only sixteen discharges, but completely filled twice and overflow to the river occurred. During 1970, there were 46 discharges and the pond filled once overflowing to the river. Over the two year period, 37.75 million gallons of combined sewage (93.7 per cent of the toal discharge volume) were withheld from the river for subsequent treatment. There were no observed detrimental effects on treatment plant operation due to the increased intermittent flows from the detention pond. The estimated cost of operating and maintaining the pond and associated facilities was $7,300 per year for the two year period. Capital costs were $6,780 per acre of drainage area including some relief combined sewer and increased size of units at the waste water treatment plant. (EPA abstract)
W73-03514

CONTROL OF MERCURY CONTAMINATION IN FRESHWATER SEDIMENTS,
Robert S. Kerr Water Research Center, Ada, Okla.
D. S. Yeaple, E. E. Johanson, and G. Feick.
Copy available from GPO Sup Doc as EP1.23/272-077, $2.00; microfiche from NTIS as PB-214 107, $0.95. PC$4.00. Environmental Protection Agency report EPA-R2-72-077, October 1972. 156 p, 21 fig, 27 tab, 22 ref, 6 append. EPA Project 16080 GWU. 68-01-0060.

Descriptors: *Water quality control, *Metals, *Mercury, Water pollution treatment, Sediments, Sludge treatment, Waste water treatment, Pollution abatement, *Dredging, *Massachusetts.
Identifiers: *Sediment treatment, *Ashland (Mass).

Methods for controlling the release of mercury from sediments have been developed, and the effects of dredging on the redistribution of mercury have been evaluated. A program of laboratory studies was conducted concurrently with a field survey where the extent of mercury contamination at a typical site was evaluated. Laboratory studies consisted of both partitioning and aquarium experiments using artificially contaminated sediments as well as sediments from the polluted field site. Inorganic sulfides and long-chain alkyl thiols with suitable modifications were found to be the most effective binding agents. A number of factors were identified which affect the decision to decontaminate a polluted sediment or to remove the material by dredging. If the material is to be dredged, precautions must be taken when land disposal methods are used. The field survey consisted of determining both the horizontal and vertical extent of the mercury contamination as well as pertinent hydraulic parameters. From results of the laboratory and field work, a pilot field project is described whereby techniques for controlling mercury contamination can be evaluated at a site where the field conditions have been fully established. (EPA abstract)
W73-03517

STORM SEWER DESIGN -- AN EVALUATION OF THE RRL METHOD,
Illinois State Water Survey, Urbana.
J. B. Stall, and M. L. Terstriep.
Copy available from GPO Sup Doc as EP 1.23/2;72-068, $1.25; microfiche from NTIS as PB-214 134, $0.95. Environmental Protection Agency report EPA-R2-72-068, October 1972. 73 p, 38 fig, 13 tab, 28 ref. EPA Project 11030 FLN.

Descriptors: *Storm drains, *Storm runoff, Rainfall-runoff relationships, Closed conduit flow, *Sewers, Hydrographs, Surface drainage, Peak discharge, Surface runoff, Urbanization, Design flow, *Drainage systems.
Identifiers: *RRL method, *Urban basins.

Storm rainfall and runoff data were assembled from 10 urban basins in the U.S.A. ranging in size from 14 acres to 8 sq mi. The British RRL method of storm drainage design was applied to the 10 basins. The RRL method considers the urban basin to be comprised of the paved area of the basin which is directly connected to the artificial storm drainage system. In 3 of the 10 basins the RRL procedure was deemed to be appropriate and suitable for the design of a storm drainage system within the normal range of frequency of design rainfall events, from 2 to 20-year events. For greater storms and for certain cases within this frequency range, the RRL method breaks down because the runoff coming from the grassed area of the basin is significant. If the basin is highly steep or if the paved area comprises less than 15% of the total basin, this breakdown occurs. An example is given of the use of the RRL method in the re-design of an existing storm drainage system, as is current practice in Great Britain. (EPA abstract)
W73-03519

FINANCIAL GRANT ASSISTANCE TO THE CITY OF SANTA ROSA, SONOMA COUNTY, CALIFORNIA, FOR THE PURPOSE OF CONSTRUCTING WATER AND SEWER LINES TO SERVE A 200-ACRE INDUSTRIAL SITE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Economic Development Administration, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-03566

WASTEWATER TREATMENT FACILITIES CONSTRUCTION GRANTS FOR NASSAU AND SUFFOLK COUNTIES, NEW YORK (FINAL ENVIRONMENTAL INPACT STATEMENT).
Environmental Protection Agency, New York. Region II.

Available from the National Technical Information Service as EIS-NY-72-5163-F, $21.25 in paper copy, $0.95 in microfiche. July 1972. 327 p, 11 fig, 3 maps, 35 tab.

Descriptors: *Environmental effects, *Waste treatment, *New York, *Sewage disposal, Water pollution control, Water pollution sources, Municipal wastes, Atlantic Ocean, Sludge disposal, Pollutant identification, Administrative agencies, Waste disposal, Organic wastes, Sewage sludge, Shellfish, Sewers, Sewerage, Sewage treatment, Effluents, Groundwater, Secondary treatment, Salinity, Outlets.
Identifiers: *Environmental Impact Statements, Long Island Sound (NY), New York Harbor (NY), Long Island (NY).

Nassau and Suffolk Counties on Long Island in New York State have requested funds from the Environmental Protection Agency for construction of new sewage treatment plants and outfalls and additions and alterations of existing sewage treatment plants and sewers. The impact of this project will be to reduce the quantity of water in the Long Island aquifers while improving groundwater quality. The highly treated effluent will be introduced into the marine environment. Waste sludge produced at the treatment plants will require disposal in a manner that will not significantly disrupt the environment. Septic tank service in Suffolk County with resulting pollution of ground-water resources will be alleviated by collection and treatment. Adverse effects include lowering of ground-water levels, increased salt water encroachment, and possible contamination of marine areas at the sites of effluent and sludge disposal. Alternatives include non-structural controls and regional collection systems for sewering; treatment plant employment of various processes to obtain secondary treatment effluent quality or advanced waste treatment processes to produce an effluent suitable for domestic reuse or to do nothing. Comments from interested agencies are included. (Tolle-Florida)
W73-03573

PROCESS FOR THE SEPARATION OF SOLIDS FROM A SUSPENSION THEREOF IN WATER BY MEANS OF AGGLOMERATION,
Shell Oil Co., New York. (assignee)
P. Visser, J. Boom, and G. J. Van Noesel.
U. S. Patent No. 3,607,743, 5 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1231, September 21, 1971.

Descriptors: *Patents, *Waste water treatment, *Suspended solids, *Suspension, Treatment, Turbulence, Water treatment, Water pollution, Water pollution treatment, Water pollution control, Water quality, Water quality control.
Identifiers: *Agglomeration.

The suspension and a binding agent are passed through an agglomeration zone in which a turbulent motion is maintained. In addition to a binding agent a surface active agent may be an important auxiliary substance in the agglomeration process.

The turbulent motion in the agglomeration zone can be created by an agitator. (Sinha-OEIS)
W73-03607

ION-EXCHANGE PROCESSES,
Permutit Co. Ltd., London (England). (assignee)
E. I. Akeroyd.

Descriptors: *Patents, *Ion exchange, *Resins, Water quality, Water quality control, *Water purification, *Waste water treatment, Water treatment, Abatement, Pollution abatement, Water pollution, Water pollution control, Water pollution treatment.
Identifiers: *Magnetic beads.

Water is treated by passing it through a bed of ion-exchange resin in an absorber. The ion-exchange capacity is maintained by removing exhausted resin and passing it through a regenerator. The regenerated resin is then returned to the liquid-outlet end of the bed. The resin is in the form of beads less than 295 microns in size containing finely divided magnetic material. (Sinha-OEIS)
W73-03608

SEWAGE TREATMENT,
Nalco Chemical Co., Chicago, Ill. (assignee)
D. A. Nelson.
U. S. Patent No. 3,607,738, 3 p, 8 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1230, September 21, 1971.

Descriptors: *Patents, *Waste water treatment, *Phosphates, *Lime, *Tertiary treatment, Abatement, Pollution abatement, Water pollution treatment, Water quality, Coagulation, *Sewage treatment.
Identifiers: *Polyamines.

In a tertiary treatment plant lime and polyamines are mixed with the secondary effluent. The polyamines catalyze the reduction of phosphate in the sewage by the lime. Coagulation and settling are more rapid because of the use of a catalyst. (Sinha-OEIS)
W73-03609

METHOD AND APPARATUS FOR THE AEROBIC PURIFICATION OF SEWAGE WATER AT A TEMPERATURE HIGHER THAN THE AMBIENT TEMPERATURE,
Stenberg-Flygt A.B., Solna (Sweden).
S. G. Y. Gamer.
U. S. Patent No. 3,607,737, 4 p, 2 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1230, September 21, 1971.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Oxygenation, *Aerobic treatment, *Heat treatment, Water pollution, Water pollution control, Water pollution treatment, Water quality, Water quality control, Abatement, Pollution abatement.
Identifiers: *Prevention, *Pollution prevention, *Water pollution prevention.

Sludge removed from sewage water is passed to an exothermic reaction zone possessing a small volume in comparison with the main body of the sewage water. The sludge is treated with dispergated air provided in a quantity proportional to the BOD so as to provide at 40 C four times the volume of air used at 15 C. The mean reaction time of the sludge in the reaction will be 15 days. The sludge is subjected to exothermic oxygenation, while retaining the reaction heat generated. (Sinha-OEIS)
W73-03610

SYSTEM FOR TREATMENT OF SECONDARY SEWAGE,
Air Reduction Co., Inc., New York. (assignee).
H. K. Hover, D. Th. A. Huibers, and L. J. Serkanic.
U. S. Patent No 3,607,735, 7 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1229, September 21, 1971.

Descriptors: *Patents, *Biochemical oxygen demand, *Waste water treatment, *Sewage treatment, *Activated sludge, Oxygen, Aerobic bacteria, Organic matter, Water pollution, Water pollution treatment, Water pollution control, Water quality, Water quality control.

Sewage effluent from a primary treatment plant is treated in a pipeline reactor with pure oxygen and activated sludge for removing organic impurities. The pipeline reactor is preferably located underground below the frostline. As the confluence passes through the reactor it is turbulently mixed for ensuring intimate and thorough contact between the oxygen, existing aerobic bacteria and the organic impurities on which bacteria feed. Activated sludge and clear waste water are produced. (Sinha-OEIS)
W73-03611

AIR-WATER DEPOLLUTION SYSTEMS,
J. W. Brant.
U. S. Patent No. 3,607,690, 6 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1220, September 21, 1971.

Descriptors: *Patents, Air pollution, *Industrial wastes, *Domestic wastes, *Sewage treatment, *Electrolytes, *Centrifugation, *Oxidation, *Waste water treatment, Water quality, Water quality control, Water pollution, Water pollution treatment, Water pollution control, Abatement, Pollution abatement, Treatment, Equipment.
Identifiers: Pollution prevention, Water pollution prevention.

The emission stream is centrifuged as it is forced through an ascending spiraling duct having perforations. Some particulate matter is removed centripetally from the emission stream. The emission is drawn through a dense magnetic field to further cleanse it of particulate matters. Gaseous contaminants are dissolved in cold, deionized water. The reaction is accomplished in the presence of a catalyst which enhances the production of an electrolyte source for subsequent electrochemical and/or oxidative use. Industrial waste water or municipal sewage water can be introduced and mixed with the electrolyte source. Centrifugation will remove the solid wastes. The remaining organic and nonorganic contaminants may be electrochemically oxidized in a programmed electrochemical processor which utilizes the Donan Equilibrium Principle. (Sinha-OEIS)
W73-03612

AERATION,
Simon-Carves Ltd., Stockport (England). (assignee).
W. S. Robertson.
U. S. Patent No. 3,606,984, 2 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1081, September 21, 1971.

Descriptors: *Patents, *Aeration, Water pollution treatment, Water pollution, *Waste water treatment, Abatement, *Pollution abatement.

A surface aeration apparatus comprises a rotatable surface aerator and radially disposed baffle plates. The distance between the inner end of each baffle plate and the axis of rotation of the aerator is between 0.2 and 0.5 of the diameter of the aerator. The aerator is circular in plan view and the arrangement is such that, during operation, the depth of the liquid is not more than 1.7 times the diameter of the aerator. (Sinha-OEIS)
W73-03615

WATER TREATING PROCESS,
Texaco Inc., New York. (assignee).
E. Cole, and H. V. Hess.
U. S. Patent No. 3,606,731, 4 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1015, September 21, 1971.

Descriptors: *Patents, *Waste water treatment, *Oil industry, *Oil wastes, Oil, Gas, *Industrial wastes, *Chemical Oxygen Demand, Water treatment, Treatment, Aeration, Water pollution treatment, Water pollution, Water pollution control.
Identifiers: *Coke.

A process is provided for breaking emulsions such as algae-oil-water into gas, oil, water and coke. Included are the following: the coking of the emulsions under autogenous pressure at 450 to 700F for 0.5 minutes to 120 minutes, then cooling to form a four phase system - gases, oil, water and coke; the gases are vented; the oil is removed; the coke is filtered off and the water phase separately collected. The COD of the water can be reduced by treating with air at elevated temperature prior to final disposal. (Sinha-OEIS)
W73-03617

LIQUID PURIFICATION SYSTEM,
Johns-Manville Corp., New York. (assignee).
E. C. Kehoe, and R. Rinaldi.
U. S. Patent No. 3,600,307, 7 p, 13 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 889, No 3, p 962, August 17, 1971.

Descriptors: *Patents, *Liquid wastes, *Water purification, *Waste water treatment, *Filtration, Equipment, Abatement, *Pollution abatement, Water treatment, Water quality, Water quality control, Water pollution, Water pollution control, Water pollution treatment.
Identifiers: Water pollution prevention.

A moving bed filter in which waste water flows countercurrent to the moving bed is described. Filtration is carried out in an inclined frusto-conical chamber in which the filter medium moves upward. The liquid waste is introduced through an exposed foreward face and passed through the bed, and the treated liquid is withdrawn from the bed. The particulate solid treatment medium is moved in a direction opposite to the direction of liquid flow and the spent particulate treatment solid is withdrawn. (Sinha-OEIS)
W73-03618

SONIC FILTER CLEANING APPARATUS AND METHOD,
FMC Corp., San Jose, Calif. (assignee).
P. Edgerton.
U. S. Patent No. 3,600,305, 4 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 889, No 3, p 962, August 17, 1971.

Descriptors: *Patents, *Waste water treatment, *Liquid wastes, Equipment, Filters, *Filtration, Water quality, Water quality control, Abatement, Pollution abatement, Water pollution treatment, Water pollution.
Identifiers: Water pollution prevention.

A circular clarification tank has a vertical hollow center column through which liquid enters the tank and from which it is discharged through ports near the upper terminus. A vertical annular filtering screen which extends above the liquid level in the tank is concentric with a circular effluent weir. Heavier solid particles settle to the bottom of the tank and are collected by a rake. Lighter particles ultimately collect on the annular filter. Two sonic filter cleaners are mounted at opposite ends of a horizontal beam or bridge that is placed diametrically in the tank. These move around the tank while sonically vibrating solid particles off the screen and are withdrawn with the aid of two submersible pumps. (Sinha-OEIS)
W73-03619

APPARATUS FOR SEPARATING SOLIDS FROM LIQUIDS,
R. F. Worlidge.
U. S. Patent No. 3,599,795, 3 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 889, No 3, p 848, August 17, 1971.

Descriptors: *Patents, *Waste water treatment, Solid wastes, *Filtration, *Gravity, Water treatment, Equipment, Abatement, Pollution abatement, Water quality, Water quality control, Water pollution control, Water pollution treatment.
Identifiers: Water pollution prevention.

In this filtration apparatus, solids are conveyed to a collection point, while permitting the liquid to pass to a collection tank. An endless conveyor has scrapers to remove unfiltered solids. Drainage apertures in the lower region of the receptacle permit the passage of liquids under gravity while unfiltered solids are trapped on the conveyor. (Sinha-OEIS)
W73-03620

PURIFICATION PLANT FOR AERATION OF SEWAGE,
A. Schreiber, and M. Danjes.
U. S. Patent No. 3,599,794, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 889, No 3, August 17, 1971.

Descriptors: *Patents, *Aeration, *Sewage treatment, Equipment, *Waste water treatment, Treatment, Abatement, Pollution abatement, Water quality, Water quality control, Water pollution, Water pollution control, Water pollution treatment, *Treatment facilities.
Identifiers: Water pollution prevention.

This sewage treatment plant has an annular aeration tank with an aeration bridge mounted so that it can rotate. The air bubbles which are introduced travel over a long path. Due to braking of the waterflow, the air bubbles emerging from the air distributors are vigorously deflected from the vertical ensuring the introduction of oxygen in an economic manner. At the same time, sewage-activated sludge mixtures and any deposits on the bottom of the tank continue to be whirled up and held in suspension. (Sinha-OEIS)
W73-03621

APPARATUS FOR WATER PURIFICATION,
For primary bibliographic entry see Field 05F.
W73-03624

SEWAGE TREATMENT APPARATUS,
Autotrol Corp., Glendale, Wis. (assignee).
R. L. Antonie.
U. S. Patent No. 3,596,767, 5 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 889, No 1, p 125, August 3, 1971.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Equipment, *Biological treatment, Treatment, Abatement, Pollution abatement, Water quality, Water quality control, Water pollution, Water pollution control, Water pollution treatment.
Identifiers: *Prevention, *Pollution prevention, *Water pollution prevention.

This apparatus consists of a biological treatment tank which includes a rotatable biological contactor and a device for sensing the hydraulic flow rate and the organic content of the sewage. Recycling secondary sludge occurs as a function of the hydraulic flow rate and organic concentration. (Sinha-OEIS)
W73-03625

SLUDGE-DEWATERING APPARATUS,
General American Transportation Corp., Niles, Ill. (assignee).
D. S. Schover.
U. S. Patent No. 3,601,039, 9 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 889, No 4, p 1148, August 24, 1971.

Descriptors: *Patents, *Sludge treatment, *Domestic sewage, *Industrial wastes, *Waste water treatment, Equipment, Treatment, Water quality, Water quality control, Abatement, Pollution abatement, Water pollution, Water pollution control, Water pollution treatment, *Dewatering.
Identifiers: Water pollution prevention.

A compressible, resilient sheet of porous cellular material is supported so as to permit the liquid flowing through it and then out its bottom surface to leave the sheet by gravitational flow. Sludge is added to the top surface of the sheet and pressure is applied downward against the sludge and the supported sheet. Pressure is applied through an overlying sheet of such material. The second sheet traps sludge between the sheets. Liquid passes from the sludge downward through the sheet and is then removed. The dewatered sludge is then removed from the cellular sheet of material. (Sinha-OEIS)
W73-03626

SEWAGE TREATMENT UNIT,
Future Products Development Corp., McLean, Va. (assignee).
B. Ray.
U. S. Patent No. 3,568,836, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 884, No 2, p 577, March 9, 1971.

Descriptors: *Patents, *Sewage treatment, Separation techniques, Solid wastes, Equipment, Water pollution, Water pollution treatment, Water pollution control, Abatement, Pollution abatement, *Waste water treatment.
Identifiers: Water pollution prevention.

The unit includes a frame with a vertically slideable float and collector bin and a guiding device to direct solids into the bin. The added buoyance raises the float out of the water when the bin is filled. (Sinha-OEIS)
W73-03627

ACTIVATED CARBON (ADSORPTION) TO REMOVE ORGANIC CONTAMINANTS FROM WATER,
Western Corp., Covington, Va. Carbon Technical Service Lab.
A. Y. Hyndshaw.
Presented at the American Water Works Association Annual Conference, Denver, Colorado, June 16, 1971. 11 p, 3 fig, 2 tab.

Descriptors: *Waste water treatment, *Tertiary treatment, *Activated carbon, *Water treatment, Organic compounds, Organic pesticides, Municipal wastes, Oil wastes, Odor, Taste, Water pollution abatement, Heavy metals.

Activated carbon, which is carbon treated to have a large surface area, acts like a sponge on a molecular scale. With surface areas of 500 to 2,000 square meters per gram, it adsorbs many impurities and is especially effective with non-polar, heavy molecules. Used either in a column or as powdered carbon added to a batch process, the column process is theoretically, a more complete utilization of the sorptive capacity of the carbon. It has the added advantage that it does not need to be settled out as does powdered carbon in a batch process. The sequence of the use of activated carbon is important because, in most cases, it is best to use the carbon before chlorination. Exceptions have been noted where chlorination is most useful when done before activated carbon is used. Its use for removing tastes and odors has been extended to the use of activated carbon for removal of refractory organics and other compounds which do not impart a taste or odor to the water. For the pesticide Lindane, for example, 20 ppm carbon will remove about 7 ppm Lindane from a concentration of 8ppm. Future uses will likely include the use of carbon for the removal of heavy metals. (Poertner)
W73-03637

ENVIRONMENTAL ENGINEERING INVESTIGATION OF UNDERGROUND FORCE MAINS, CORROSION SURVEY AND PIPE MATERIAL ANALYSIS ON A DESIGN LIFE BASIS.
Murphy Engineering, Inc., Chicago, Ill.

Metropolitan Sanitary District of Greater Chicago, Chicago, Illinois, (1972). 184 p, 12 fig, 15 tab, 92 ref.

Descriptors: *Pipelines, *Pipe tests, *Material tests, *Corrosion, *Corrosion control, Soil chemistry, Sewage sludge, Stray current corrosion, Pitting, Engineering evaluation, Illinois, Design criteria, Field investigations.
Identifiers: *Chicago (Ill), *Pipe breakage.

Frequent breaks have occurred in the sludge line of the Metropolitan Sanitary District of Greater Chicago between the North Treatment Works and the Southwest Treatment Works. This study was undertaken to investigate various pipe materials and the incidence of corrosion to predict useful life expectancies and to guide the future choice of pipe material. The present line is a 40-year-old Class 150, (centrifugally cast) cast iron pipeline of 14 inches and 16 inch diameter about 19 miles long. After gravity thickening at the North Treatment Plant, the activated sludge was pumped under a pressure of 100 psi. Pipe quality was fairly typical of presently-obsolete pipe, entailing numerous gaseous inclusions and excessive porosity. In 47 years, 40 pipe failures had occurred, 37 of these failures were from 1950 to 1968. The entire pipeline was replaced and a consultant was hired to find the cause of the breaks. It was believed that stray electrical currents might have been the influencing factor. Pipe failure could be the result of both internal and external factors including: (1) pressure, (2) corrosiveness of the sludge, (3) sludge deposits, (4) poor pipe quality, (5) degradation from soil acidity, (6) disturbance of soil by nearby construction, (7) pH and (8) oxidation-reduction exchanges, as well as stray currents. Recommendations for pipe protection against external factors are given as well as descriptions of types of pipe materials available. (Poertner)
W73-03648

IMPLEMENTING THE CHICAGO PRAIRIE PLAN,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 05E.
W73-03649

COMPREHENSIVE SEWERAGE STUDY, PHASE TWO--SEWERAGE FACILITIES PLAN, YORK COUNTY, PENNSYLVANIA.
Bourquard (E. H.) Associates, Inc., Harrisburg, Pa; and Herbert Associates, Inc., Harrisburg, Pa.

York County Planning Commission, York, Pennsylvania, June 1972. 60 p, 3 fig, 3 tab.

Descriptors: *Sewerage, *Planning, *Water pollution control, *Pennsylvania, Sewage districts, Sewage treatment, Municipal wastes, Waste water disposal, Tertiary treatment, Construction costs, Operating costs, Regional analysis.
Identifiers: *York County (Penn), Regional treatment.

York County, Pennsylvania, with a 1970 population of 273,000, is expected to grow to about 505,000 by the year 2000. Wastewater management is recognized as essential for any plans to provide

for future demands without destroying all water sources. Development of a plan should include land use, future growth, recreational values, technology of wastewater disposal, economic feasibility and environmental impacts. Only 46 percent of York County's population is served by municipal wastewater systems and the pollution in one of the county's main streams, Codorus Creek, is among the nations worst. Many of the sewage plants are unsatisfactorily treating their wastes. The approach used in the report for these problems is five-fold: (1) a brief discussion of the concepts and problems of wastewater management, (2) identification of areas where public sewerage facilities are needed, (3) a general layout for these facilities on a regional basis for 1980 and 2000, (4) cost estimates of these facilities, and (5) methods of administration and financing. A generalized, regional plan is proposed and gives prime consideration to the following: economic feasibility, water recycling with stream flow augmentation, and open space preservation. Under Pennsylvania law, areas can be forced to work within regional plans if it can be shown that it is in the interest of the people. Total annual costs for 1980 are put at $ 16 million, while costs in the year 2000 are estimated to be $ 32 million for the 21 regional systems. (Poertner)
W73-03650

A STUDY OF UTILITIES IN THE TOLEDO REGIONAL AREA.
Finkbeiner, Pettis and Strout Ltd., Toledo, Ohio.
For primary bibliographic entry see Field 06D.
W73-03651

TASTE AND ODOR CONTROL FOR PALATABLE WATER.
Tufts Univ., Medford, Mass. Coll. of Engineering.
For primary bibliographic entry see Field 05F.
W73-03659

ANAEROBIC DIGESTION OF SLUDGES CONTAINING IRON PHOSPHATES (DISCUSSION),
Notre Dame Univ., Ind. Dept. of Civil Engineering.
P. C. Singer, and T. L. Theis.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA 5, p 784-786, October 1972, 2 fig, 5 ref.

Descriptors: *Activated sludge, *Iron compounds, *Phosphates, Oxidation, Reduction, *Anaerobic digestion, *Waste water treatment, Domestic wastes, Humic acids.
Identifiers: *Iron phosphate, Iron oxidation.

It was observed that primary sludges containing iron phosphate exhibited a significant uptake of phosphorus during anaerobic digestion, while digestion of thickened waste activated sludge resulted in a release of phosphorus. This release of phosphate was attributed to the changing oxidation state of the iron. Studies indicated that the oxidation of ferrous iron in an activated sludge was severely retarded. Possible explanations for this observed retardation were given. Oxygen consumption by organic matter in the aeration tank was noted to impede iron oxidation. Also, the presence of humic substances in domestic wastewater has been shown to interfere with ferrous iron oxidation by complexing the divalent iron or by rapidly reducing ferric iron once it is formed. (See also W72-00414) (Murphy-Texas)
W73-03672

BIOLOGY OF WATER POLLUTION: EFFECTS AND CONTROL,
Aston University, Birmingham (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W73-03673

GIANT PLASTIC DISCS FIGHT POLLUTION.

Society of Petroleum Engineers Journal, Vol 28, No 7, p 11, July 1972.

Descriptors: *Waste disposal, *Organic wastes, Treatment facilities, Biological treatment, Biomass, *Sewage treatment, *Waste water treatment, Plastics.
Identifiers: *Polystyrene discs.

Large discs made of expanded polystyrene are key components in a system capable of doubling the capacity in many secondary treatment organic waste disposal plants. The discs, which are 11 ft. in diameter, 1/2 in. thick, and weigh only 12 lbs., are molded of Sinclair-Koppers Dylite by Expanda-Foam Co., Antioch, Illinois. In operation, the discs are half submerged in waste material while being slowly rotated on a shaft. Alternate immersion and exposure to air aids the growth of the biomass which converts the organic wastes into harmless substances. (Murphy-Texas)
W73-03675

THE UPTAKE AND PERSISTENCE OF PESTICIDES IN AN ALGAE-LADEN ENVIRONMENT,
Virginia Polytechnic Inst., Blackburg.
For primary bibliographic entry see Field 05B.
W73-03676

SPEEDS WASTE ANALYSIS,
Beckman Instruments, Inc., Fullerton, Calif.
For primary bibliographic entry see Field 05A.
W73-03677

COPRECIPITATION OF ORGANIC COMPOUNDS FROM LAKE WATER BY IRON SALTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
N. Sridharan, and G. F. Lee.
Environmental Science and Technology, Vol 6, No 12, p 1031-1033, November 1972, 5 tab, 6 ref.

Descriptors: *Organic compounds, *Phenols, *Hydrogen ion concentration, Iron compounds, Alkylbenzene sulfonates, Freshwater, *Waste water treatment, Water pollution control.
Identifiers: Ferric chloride, Formaldehyde, Citric acid, Dextrose, Coprecipitation.

Known amounts of various organic compounds were added to fresh water in the presence of ferric chloride and the extent of recovery of the compounds by coprecipitation was measured. An increase in the dissolved organic content of the water was correlated with a percentage increase in phenol recovery while the reverse was observed for citric acid. The effects of pH on the percent recovery were different for each of the compounds studied. The positive effect of organic matter on phenol recovery and the lack of a pH effect for phenol suggested that more then simple coprecipitation may be involved. Ferric chloride addition at neutral pH did not remove dextrose, alkyl benzene sulfonate or formaldehyde. While investigation has shown that iron coprecipitation can be used to concentrate some dilute solutes from fresh waters, the removal of various organic compounds has been found to depend on the type of compound, type of water, concentration of water, and pH. (Murphy-Texas)
W73-03678

EFFLUENT DISPOSAL IN AN INTEGRATED WORKS,
British Steel Corp. (England). Strip Mills Div.
R. W. Cave.
Journal of the Iron and Steel Institute, p 202-209, March 1971, 2 fig, 5 tab, 10 ref.

Descriptors: *Waste water treatment, *Steel, Water pollution control, *Nickel, *Chromium, Cost analysis, Liquid wastes.
Identifiers: Carbonate treatment, Pickling, Amalgamation, Wastes recovery.

In an integrated steelworks the problem of treating liquid effluents is quite complicated. Treatment is much more difficult when random amalgamation of the effluents occurs. A study of the situation suggests that the effluents be segregated and selectively remixed under controlled conditions. The special problems of treating liquid effluents at the Ebbw Vale works are discussed along with efforts being taken to meet the demands of the local river authority. The choice of the carbonate process to treat waste discharges associated with the continuous pickling of steel strips is discussed along with other special problems. Attempts to recover and exploit nickel, chromium and other effluent products are also mentioned. (Murphy-Texas)
W73-03679

TAILINGS DISPOSAL, GENERATION OF ACIDITY FROM PYRRHOTITE AND LIMESTONE NEUTRALIZATION OF WASTEWATER AT FALCONBRIDGE'S ONAPING MINES,
Falconbridge Nickle Mines Ltd., Toronto (Ontario).
L. S. Rivett, and U. M. Oko.
The Canadian Mining and Metallurgical Bulletin, Vol 64, p 108-113, August 1971, 3 fig, 4 tab, 12 ref.

Descriptors: *Acid mine water, *Mine drainage, *Neutralization, Water pollution control, *Waste water treatment, Sulfides, Environmental control, *Reclaimed water, Recirculated water, *Canada.
Identifiers: *Moose Lake (Ontario), *Tailings disposal, *Pyrrhotite, Strathcona concentrator.

Acid formation caused by water contacting the sulphide mineral pyrrhotite presented a water pollution problem when the new Strathcona mine and concentrator was brought into production. Since the already acidic Moose Lake was the only available water supply, process water had to be recirculated. To accomplish this a small dam was built to convert the northwest arm of Moose Lake into the Strathcona tailings disposal basin. A neutralization plant was constructed that used finely ground limestone to neutralize the acidity. Having operated continuously for several years, the system has produced good quality neutral water from a modest investment and at low operating costs. (Murphy-Texas)
W73-03680

MUNICIPAL WASTEWATER AIDS REVEGETATION OF STRIP-MINED SPOIL BANKS,
Pennsylvania State Univ., University Park.
W. E. Sopper, and L. T. Kardos.
Journal of Forestry, Vol 70, No 10, p 612-615, October 1972, 4 fig, 2 tab, 5 ref.

Descriptors: *Spoil banks, *Municipal wastes, *Soil stabilization, Sludge, Effluents, *Waste water disposal, Strip mine wastes, Acidic soils, Fertility, *Revegetation, *Pennsylvania, *Water reuse.
Identifiers: Clearfield County (Penn).

Spoil banks left by strip mining are often highly acidic, contain toxic levels of metals, are droughty and low in fertility, and develop extremely high surface temperatures in the summer. Characteristics of municipal waste indicated that their use should aid in the revegetation of such areas. To test this hypothesis, each of ten large boxes was filled with 25 tons of spoil material from a barren bank in Clearfield County, Pennsylvania. With two untreated boxes as controls, the remaining boxes were treated weekly with different combinations of sewage effluent and sludge. Over a three year period, a variety of vegetation was planted in each box. While no vegetation survived in the control boxes, tree seedlings survived and

grass and legume seed germinated in all the treated boxes, with the best results from boxes receiving both effluent and sludge. Results indicated that municipal wastewater and sludge can be used to reclaim and revegetate many spoil banks in the Appalachian region. (Murphy-Texas)
W73-03681

ADVANCED WASTE TREATMENT IN HATFIELD TOWNSHIP,
Tracy Engineers, Inc., Camp Hill, Pa.
F. R. Gaines, and C. E. Hartley.
Water Pollution Control Association of Pennsylvania Magazine, p 4-7, May-June 1972, 8 fig, 3 tab, 11 ref.

Descriptors: *Waste water treatment, *Tertiary treatment, Chemical treatment, Activated sludge, Flocculation, Filtration, Lime, *Design, *Treatment facilities, *Pennsylvania.
Identifiers: Design parameters, Flow equalization, Hatfield Township (Penn).

With the aid of construction funds from the Environmental Protection Agency, the Hatfield Township Municipal Authority has included advanced waste treatment facilities in their expansion program. The final design included flow equalization basins, chemical treatment of raw wastewater with lime, followed by a complete-mix activated sludge process and the inclusion of tertiary chemical flocculation, tube type clarification and mixed media filtration. An Environmental Protection Agency Research and Demonstration Grant was obtained to study the design parameters of the unconventional plant layout. (Murphy-Texas)
W73-03682

STUDIES ON THE ENUMERATION AND ISOLATION OF OBLIGATE ANAEROBIC BACTERIA FROM DIGESTING SEWAGE SLUDGE,
Purdue Univ., Lafayette, Ind.
E. J. Kirsch.
Developments in Industrial Microbiology, Vol 10, p 170-176, 1969, 5 tab, 6 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Sewage treatment, Bacteria, Anaerobic conditions, *Anaerobic bacteria, *Sludge digestion, Sewage sludge, *Pollutant identification.
Identifiers: Settled sewage, Culture media.

Methods for the enumeration and isolation of nonmethanogenic bacteria using strict anaerobic conditions and a habitat-stimulating medium are developed. The medium contained a weak hydrolysate of settled sewage and digested sewage supernatant and regularly gave higher viable counts than that of other media employed. Its growth-stimulating properties are further evidenced by the increased growth rate and cell yield of a few pure culture isolates. While many abnormal, elongated cells were present in unsupplemented medium, few if any, were in the supplemented medium. The predominate bacterial flora consisted of gram-negative, nonspore-forming bacilli. About 25 per cent shared the following characteristics: (1) fermented carbohydrate to yield hydrogen gas, (2) produced butyric acid from sterile sewage sludge, and (3) exhibited spinning motility by means of flagella. (Murphy-Texas)
W73-03683

PARTIAL AND TOTAL SULFUR RECOVERY,
Institut Francais du Petrole, New York.
P. Bonnifay, R. Dutriau, S. Frankowiak, and A. Deschamps.
Chemical Engineering Progress, Vol 68, No 8, p 51-52, August 1972, 1 fig.

Descriptors: Sulfur, Cost analysis, Air pollution, Economics, Pollution abatement, Recycling, Ammonia, *Waste water treatment.
Identifiers: *Aqueous ammonia, Refineries, Tail gas, *Sulfur recovery.

The IFP catalytic process can be used in refineries to control all sulfur-containing wastes by converting them to salable sulfur, thus eliminating air and water pollution problems. Overall Claus-IFP recoveries can be higher than 99.3% with very good sulfur product quality. The IFP process is a waste-free process that does not create water pollution since all the effluents are salable, recycled, or innocuous. The scrubbing agent, aqueous ammonia, is recycled at low cost. Overall costs for a 200 ton per day sulfur plant are about $53 per million std. cu. ft. tail gas treated. Flexibility in the location of certain equipment to fit in with existing refining and petrochemical operations can result in large savings in capital investment. (Murphy-Texas)
W73-03684

DIGITAL COMPUTER SIMULATION OF WASTEWATER TREATMENT,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
P. W. Cummings.
Master's Thesis, August 1969, 171 p, 2 fig, 4 tab, 23 ref, 5 append.

Descriptors: *Computer models, *Activated sludge, *Cost analysis, *Cost comparisons, *Waste water treatment, Model studies, *Simulation analysis, Sludge digestion, Dewatering.
Identifiers: *Computer simulation.

Computer simulations of modifications applied to the standard activated sludge process were developed and integrated into a model developed by the Federal Water Pollution Control Administration. The modifications developed were: (1) deletion of primary treatment; (2) aerobic sludge digestion; and (3) a more complete routine for sand bed sludge dewatering. Cost estimates associated with the modifications are presented and comparisons are made with the standard system of activated sludge. (Smith-Texas)
W73-03685

BIO-DEGRADABILITY AS MEASURED BY DIFFERENTIAL MANOMETER,
Michigan State Univ., East Lansing. Dept. of Civil Engineering.
K. L. Schulze, and T. C. Hoogerhyde.
Developments in Industrial Microbiology, Vol 8, p 284-297, 1967, 9 fig, 1 tab, 16 ref.

Descriptors: Mathematical studies, *Biological treatment, *Growth rates, *Biodegradation, *Respiration, Water pollution, *Waste water treatment, *Bacteria, Cultures.
Identifiers: Oxygen consumption, Waste water classification, Primary effluent.

Experimentation with continuous flow cultures of bacteria has shown that the specific respiration rate KR is directly proportional to the specific growth rate Kl: $KR \pm l/xd0/dt \pm a + b$ Kl. It follows that graphing the natural logarithm of the overall rate of oxygen uptake versus time should produce a straight line with slope Kl for any period of exponential growth where Kl remains constant. The theory was tested on samples of primary effluent from several treatment plants using a differential manometer. Under normal conditions all wastewater tested showed a regular curve pattern: a straight line for several hours indicating exponential multiplication followed by a sharp break after the maximum oxygen consumption rate was achieved. The technique developed should be of value in the area of water pollution since it allows classification of wastewaters according to their biodegradability. (Murphy-Texas)
W73-03687

IN-PLANT RESEARCH AT SPRINGFIELD, MISSOURI,
E. L. Balk.
Presented at the 1972 Annual Meeting of the Missouri Water Pollution Control Association, Springfield, Missouri, February 27-29, 1972, 23 p, 6 fig, 3 tab.

Descriptors: *Waste water treatment, *Waste treatment, *Treatment facilities, Chemical treatment, Filtration, *Biochemical oxygen demand, Pilot plants, Phosphates, Algae, Suspended solids, Reaeration, *Missouri, Water quality standards.
Identifiers: *Springfield (Missouri), Polishing lagoon, Effluent Guidelines, Secondary effluent.

The City of Springfield has undertaken several in-plant research projects to help meet newly adopted Federal Water Quality Standards and Missouri Effluent Guidelines. A 1.6 million gallon single cell holding basin was built, and treatment plant secondary effluent was pumped through it at a controlled rate so that the reaeration efficiency could be studied. Overall results indicated an additional reduction in BOD and suspended solids that justified the addition of a full-scale polishing lagoon to the plant. Other studies in progress include: (1) the removal of additional BOD, suspended solids, and algae from the polishing lagoon by a microfilter, (2) the removal of phosphates by using lime and alum, (3) the removal of phosphates by using a trickling filter with metal cans media, and (4) the removal of carbonaceous BOD by using pure oxygen. (Murphy-Texas)
W73-03688

COST-EFFECTIVENESS ANALYSIS OF WASTEWATER REUSES,
Dames and Moore, Chicago, Ill.
S. C. Ko, and L. Duckstein.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA6, Paper 9434, p 869-881, December, 1972. 2 fig, 2 tab, 20 ref.

Descriptors: *Cost analysis, *Optimum development plans, *Environmental engineering, Sanitary engineering, *Water reuse, *Water supply, *Sewage disposal, Groundwater, Water resources, Alternative planning, Tertiary treatment, Irrigation water, Recycling, Systems analysis.
Identifiers: *Cost effectiveness, Sensitivity analysis.

The usefulness of applying Kazanowski's cost-effectiveness approach to civil engineering systems is demonstrated by means of a case study of water reuse. Kazanowski's method facilitates evaluating and comparing alternative systems designed to reach a given goal. The case study is concerned with two concurrent problems that are commonly facing metropolitan areas: securing an adequate water supply and disposing of the sewage effluent. Several distinct alternative systems to deal with these problems are identified, such as exchange for irrigation water, or tertiary treatment and recycling. For each alternative system, the economic analysis, the environmental impact upon implementation, and the horizontal and vertical externalities are evaluated and presented in tabular form. The result of a sensitivity analysis performed on major system variables is given. (Bell-Cornell)
W73-03692

OPTIMAL DESIGN OF URBAN WASTEWATER COLLECTION NETWORKS,
Duke Univ., Durham, N.C. Dept. of Civil Engineering.
J. S. Dajani, R. S. Gemmell, and E. K. Morlok.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA6, Paper 9414, p 853-867, December, 1972. 1 tab, 18 equ, 21 ref.

Descriptors: Economics, *Optimization, Sanitary engineering, *Network design, *Costs, Hydraulics, *Sewers, Computers, Systems analysis, Mathematical models, Pipes, Slopes, Equations, *Treatment facilities.
Identifiers: *Wastewater collection networks.

The problem of obtaining the minimum cost design for a wastewater collection network is examined. The concept of optimization is explored with respect to overall collection networks. Present design methodologies are discussed, focusing particularly upon their shortcomings; recent developments in both network layout and design are examined. The design problem of selecting an optimal mix of pipe diameters and slopes, given a set of economic and technological inputs as well as a network layout is then formulated as a nonlinear, separable convex programming problem. The formulation guarantees the generation of a global optimal solution, and a numerical solution can be obtained using existing commercially available computer software. As an operational computerized design system, this method is a potentially valuable and practical tool for rigorously incorporating local economic considerations into the design process and for obtaining a minimum cost design. It is expected to result in time and manpower savings. And, furthermore, it will allow the investigation of the cost implications of changing any of the inputs to the design process or of varying wastewater collection design standards and criteria. (Bell-Cornell)
W73-03693

OPTIMAL DESIGN OF WASTEWATER TREATMENT SYSTEMS BY ENUMERATION,
Stanford Univ., Calif. Dept. of Sanitary Engineering.
G. F. Parkin, and R. R. Dague.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA6, Paper 9403, p 833-851, December, 1972. 2 fig, 5 tab, 77 equ, 2 appen, 21 ref.

Descriptors: *Waste water treatment, Systems analysis, *Optimization, Sanitary engineering, *Costs, Computers, *Activated sludge, *Anaerobic digestion, Mathematical models, Equations, Design criteria, Biochemical oxygen demand, *Treatment facilities.
Identifiers: *Optimum design.

Wastewater treatment systems are designed to achieve specific requirements at least cost. In recent years, the tendency has been to optimize certain unit processes in isolation, without regard to effects on other units in the total treatment scheme. If the computer is to select the optimal treatment system, then all interrelated components in that system must be included in the mathematical model. An enumerative model is presented which evaluates all vital components of two common treatment systems. The model provides designs based on standard criteria and evaluates costs using published equations. It is found that Mixed Liquors Suspended Solid levels in activated sludge systems should be 3,000 mg/l. For primary settling tanks preceding activated sludge, the computer always selected the least efficient unit, in terms of BOD and suspended solids removals. Results show also that anaerobic digesters were selected over aerobic digesters in all optimal designs, but the cost difference was small. This work demonstrates the importance of considering the total system in arriving at optimal process design. (Bell-Cornell)
W73-03694

WELL CONTAMINATION--PART III, SOLUTION FOR POLLUTION,
B. Manuel.
Ground Water Age, Vol 9, No 1, p 24-27, January, 1971.

Descriptors: Water quality, Water pollution control, Water pollution treatment, Sewage treatment, *Sewage disposal, *Land use, Landfills, Effluents, Biochemical oxygen demand, Soil filters, Soil surveys, Zoning, *Septic tanks, Groundwater resources, *Urbanization.
Identifiers: Ground water protection, *Spray irrigation.

Land in the U.S. is being converted from rural to urban use at the rate of over 2 million acres per year, bringing with it problems of water-supply contamination and waste disposal. Several alternatives to the alleviation of pollution are discussed. Zoning as one solution is given, along with its limitations. 'Package' sewer disposal plants are shown to be a viable alternative to septic tanks. Soil surveys, in conjunction with the standard percolation test, were effective in determining the feasibility of septic tank installation in a given area. Land use planning, as practiced in one suburban Illinois county, is advocated as a promising method of obtaining guidelines to groundwater protection and effective waste disposal. Finally, the concept of spray irrigation, in conjunction with sanitary landfill as a closed environmental system for disposal of both solid and liquid wastes is discussed. This involves spraying of treated effluent on the land to be used as nutrients for field crops. A central parcel within the system would be used as a sanitary landfill. Such a system is being designed for a Michigan county. (Smith-NWWA)
W73-03848

BIOLOGICAL PURIFICATION OF RESIDUAL WATERS OF PAPER MILLS BY SOIL INFILTRATION: I. MODIFICATIONS IN THE WATERS DURING THEIR PASSAGE, (IN FRENCH),
Bordeaux Univ., Talence (France). Lab. of Botany and Applied Microbiology.
M. Marchland.
Botaniste. Vol 54, No 1-6, p 235-350. 1971. Illus. English summary.
Identifiers: *Waste water treatment, *Pulp wastes, Biological treatment, Color, Infiltration, Mills, Modifications, Water purification, Residuals, Soils, Chemical oxygen demand, Biochemical oxygen demand.

The biological purification of pulp and paper mill alkaline waste, by infiltration in a sandy soil is discussed. The process is economically feasible, reduces the Chemical Oxygen Demand about 90% and leads to a color removal of about 30%. The optimum processing is 600-700 m3 effluent/ha/day, corresponding to the elimination of 200 kg Biological Oxygen Demand/day.--Copyright 1972, Biological Abstracts, Inc.
W73-03863

5E. Ultimate Disposal of Wastes

WASTEWATER TREATMENT FACILITIES CONSTRUCTION GRANTS FOR NASSAU AND SUFFOLK COUNTIES, NEW YORK (FINAL ENVIRONMENTAL INPACT STATEMENT).
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 05D.
W73-03573

WASTE DISPOSAL IN THE COASTAL WATERS OF NEW YORK HARBOR.
For primary bibliographic entry see Field 05G.
W73-03589

THE OCEAN DUMPING BILL,
Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03604

LIMITING CONTAMINATION OF WASTE DISPOSAL WELLS,
Marathon Oil Co., Findlay, Ohio. (assignee).
F. H. Poettmann.
U. S. Patent No. 3,606,925, 2 p, 10 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1065, September 21, 1971.

Descriptors: *Patents, *Waste disposal wells, Aquifers, *Waste water disposal, Abatement, Pollution abatement, Water pollution, Water pollution control, Water pollution treatment, Water quality, Water quality control.
Identifiers: *Pollution prevention.

Contamination is limited by injecting a slug consisting of an aqueous mobility buffer before the contaminating materials. The buffer can be an aqueous solution containing a mobility reducing agent e.g. water-soluble polymers, water-external emulsions, or any fluid containing a mobility reducing agent which is compatible in the aquifer. (Sinha-OEIS)
W73-03616

THE AMELIORATION OF AN ACIDIC MINE SPOIL BY LIQUID DIGESTED SEWAGE SLUDGE,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 05G.
W73-03633

IMPLEMENTING THE CHICAGO PRAIRIE PLAN,
Metropolitan Sanitary District of Greater Chicago, Ill.
F. Kudrna, and G. Kelly.
Paper presented at a Symposium on Recycling of Treated Municipal Wastewater and Sludge on Forest and Croplands, Pennsylvania State University, University Park, Pennsylvania, August 21-24, 1972. 7 p.

Descriptors: *Sludge disposal, *Sewage sludge, *Waste water disposal, *Recycling, *Soil disposal fields, Reclamation, Land reclamation, Municipal wastes, Industrial wastes, Illinois, Conservation, Fertilization, Crop production, Sewage disposal.
Identifiers: *Chicago (Ill).

The Metropolitan Sanitary District of Greater Chicago was created 80 years ago by the Illinois State Legislature and has the responsibility of the day-to-day collection, treatment and recycling of all domestic and industrial wastes in the area. During these 80 years, the District has researched, investigated and practiced numerous methods of chemical and biological treatment, progressing through the years to the present day land and water reclamation project known as 'The Prairie Plan'. The District is constructing, on land laid barren by strip-mining, an environmentally safe recycle farm with integrated monitoring, quality control provisions and multiple-use facilities. The first implementation of this plan is now being carried out on over 7,000 acres of land in Fulton County, Illinois. Besides an extensive inventory and testing program, the success of the plan was seen to be largely dependent on the cooperation and public acceptance offered. Cooperation was obtained with the University of Illinois Agronomy Department, The Illinois Environmental Protection Agency and the Fulton County Board of Supervisors. Public acceptance was won through the establishment of demonstration projects of land and water reclamation in each of the eight urbanized service basins in and surrounding the Chicago metropolitan area. The completed project will require acquisition of 30,000 usable acres and should provide direction in the physical and economic development parameters of Fulton County. This could help establish open-space areas, flood control, conservation and recreational space as well as provide a new agricultural economic base for soil replenishment. (Poertner)
W73-03649

MUNICIPAL WASTEWATER AIDS REVEGETATION OF STRIP-MINED SPOIL BANKS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 05D.
W73-03681

INVESTIGATION OF ALLEGED GROUND--WATER CONTAMINATION, TRI-RUE AND RIDE OIL FIELDS, SCURRY COUNTY, TEXAS,
Texas Water Commission, Austin. Ground Water Div.
For primary bibliographic entry see Field 05B.
W73-03839

5F. Water Treatment and Quality Alteration

SAFE DRINKING WATER ACT OF 1972 (S. 3994).
For primary bibliographic entry see Field 06E.
W73-03314

LEADING CREEK CONSERVANCY DISTRICT, WATER SYSTEM PROJECT IN SOUTHEAST OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Economic Development Administration, Chicago, Ill. Midwestern Region.

Available from the National Technical Information Service as EIS-OH-72-4802-F, $11.75 in paper copy, $0.95 in microfiche. June 29, 1972. 110 p, 5 fig, 10 maps, 16 photo, 18 tab, 8 ref.

Descriptors: *Ohio, *Environmental effects, *Water supply development, *Water supply, *Treatment facilities, Surface water availability, Water resources development, Ohio River, Water demand, Water distribution (Applied), Alteration of flow, Aquatic life, Domestic wastes, Discharge (Water), Recreation facilities, Agriculture, Industrial wastes, Natural resources, Water utilization, Coal mines, Applachian Mountain Region.
Identifiers: *Environmental Impact Statements, *Leading Creek Conservancy Distric (Ohio).

The proposed project is a rural water system to serve potable water to rural residential customers, commercial establishments, schools, villages, several industrial areas and two recreation sites. Included also is a provision to provide untreated water to several industrial sites. The project is in Meigs County, Ohio, with portions extending into Vinton and Gallia Counties. The water system will consist of wells; pumping equipment; raw water and treated water storage tanks; and distribution trunk lines for domestic, commercial, industrial and recreational purposes. Adverse environmental impacts from the project itself are minimal. However, environmental effects from utilization of the water by industrial customers could include creation of solid mine waste and liquid coal processing waste, generation of sanitary wastes, alteration of landforms and possible alteration of drainage patterns. Impacts resulting from the economic presence of a major industry where there was none previously include: (1) population increase, (2) land development, and (3) generation of domestic waste. The only alternative considered was to abandon the project and find alternative sources of water. Comments of interested agencies are included. (Tolle-Florida)
W73-03350

WATER PURIFICATION AND STORAGE APPARATUS,
D. T. Bray.
U. S. Patent No. 3,616,921, 3 p, 5 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 892, No 1, p 123, November 2, 1971.

Descriptors: *Patents, *Reverse osmosis, *Water purification, Water storage, Water quality control, Water quality, *Water treatment.

A simple temporary water storage container is described for use in a reverse osmosis water purification system. Feed water is supplied to the reverse osmosis unit under pressure and this pressure is applied to one end of a storage conduit holding stored water under pressure for distribution and use. (Sinha-OEIS)
W73-03368

SINGLE-STAGE FLASH DISTILLATION APPARATUS IN A STEAM CONDENSATION PLANT,
Electricite de France, Paris (assignee).
For primary bibliographic entry see Field 03A.
W73-03379

WATER TREATMENT,
Taulman Co., Atlanta, Ga. (assignee).
For primary bibliographic entry see Field 05D.
W73-03396

WATER PURIFICATION APPARATUS,
For primary bibliographic entry see Field 05D.
W73-03398

POTOMAC RIVER REVERSE OSMOSIS TEST,
General Dynamics Corp., San Diego, Calif. General Atomic Div.
For primary bibliographic entry see Field 03A.
W73-03440

THAT ABANDONED QUARRY MAY BE A WATER ASSET,
Philadelphia Suburban Water Co., Bryn Mawr, Pa.
J. M. Ballengee.
The American City, Vol 85, No 2, p 69-71, February 1970.

Descriptors: *Water treatment, *Reservoirs, Automatic control, Automation, Chlorination, Copper sulfate, Ammonium salts, Turbidity.
Identifiers: Microscreening, Pump controls, Hexametaphosphate.

An abandoned quarry from which 17 million cu yds of rock had been removed over many decades, was converted to a water supply source, storing 500 mg in the operating range utilized in design, with another 400 mg storage at lower levels to be utilized if required in later years. Inflow amounts to about 8.2 mgd. This is located within the service area of the company. Algae have been controlled by copper sulfate. Treatment consists of screening, chlorination, stabilization with ammonium sulfate and sodium hexametaphosphate. Zurn Industries Micro-Matic screening systems are used, each ten feet long by ten feet diameter. Chlorine-residual analyzer and recorder monitor the residual and automatically shut down the pumping station should the residual fall below a predetermined minimum. A turbidity-recording controller shuts down the pumping station if the turbidity exceeds a predetermined maximum. Operation is by remote control from the control center in Bryn Mawr, some five miles away. The supervisory-control equipment automatically programs the entire sequence of pump operation from 'pre-tube' to on-stream, transmitting tone signals over leased telephone lines. (Bean-AWWARF)
W73-03453

WATER AND WASTEWATER RESEARCH IN SAN DIEGO,
San Diego Dept. of Utilities, Calif.
E. I. Crossley, and W. M. Conn.
The American City, Vol 84, No 10, p 91-93, 95, October 1969. 1 tab.

Descriptors: *Water treatment, *Waste water treatment, *Desalination, Dissolved solids, Suspended solids, *Corrosion, Reclaimed water, Water reuse, Odor, *California.
Identifiers: *San Diego (Calif).

The San Diego Utilities Department has three research programs underway; one dealing with water reclamation (desalting also reuse), another with sewage odors, and the third with the evaluation of materials and coatings for storing and conveying product and blended water. A pilot unit is used as a control tool to study known odor-control agents. Other approaches such as chelated metal compounds and phase changes by oxidation, adsorption and photo-chemical reactions were studied also. San Diego has two traditional design plants that produce water for irrigation of lawns and ornamental shrubs. The plants reduce BOD with no attempt to reduce dissolved solids. The Federal government transferred the desalting plant at Point Loma to Cuba but later built a second plant (Clair Eagle) on San Diego Bay. Meanwhile the City purchased two 1,000 gpd tubular configurations for testing. They have operated 380 hours on raw sewage and are giving 70 percent recovery from a stream containing an average of 2,000 ppm dissolved solids and 300 ppm suspended solids. The product from low-rejection membranes contains about 500 ppm total dissolved solids, while that from other membranes contains 10 to 50 ppm. Transfer of desalted water in cement lined pipes showed that changes in chemical composition were occurring, (increase in dissolved solids) also that pipe interior was softened. Present tests involve different pipes, metal alloys and paints. (Bean-AWWARF)
W73-03454

BETTER WATER RIGHT TO THE TAP,
J. Banta, and C. Craft.
The American City, Vol 83, No 1, p 75-77, January 1968.

Descriptors: *Water treatment, *Water supply, *Design, Filtration, Flocculation, Sedimentation, Hardness (Water), Water softening, Reservoirs, Standpipes, Pumping plants, Taste, Odor, Iron, Manganese, Treatment facilities, *Distribution systems, *Pennsylvania, Municipal water, Rates, Filters.
Identifiers: Filter rates, Elevated tank, *Pottstown (Penn).

A new purification plant and an overhauled distribution system provide better water to the taps. The plant has semiautomatic control in proportion to flow. The treatment consists of alum and sodium hydroxide application, activated-carbon for taste and odor control, potassium permanganate to oxidize iron and manganese, chlorine for disinfection and sodium hexametaphosphate for corrosion control. Equipment is available for adding sodium chlorite and fluoride. Hardness ranges up to 380 ppm and a portion of the sand filtered water is passed through zeolite filters to produce finished water with hardness of not more than 125 ppm. Improvements in the distribution system included replacement of 89,500 ft of four and six inch mains more than 60 years old; cleaning and lining 29,700 ft of mains over six inches in size and more than 60 years old; construction of a 500,000 gallon elevated tank and a 500,000 gallon standpipe to stabilize pressures in two areas; construction of two pumping stations; and covering the existing 8 mg open reservoir with a plastic floating cover. (Bean-AWWARF)
W73-03455

OUR RESERVOIR COVER FLOATS ON WATER,
J. Banta.
The American City, Vol 83, No 7, p 125-126, July 1968.

Descriptors: *Water supply, *Reservoirs, Water quality, Construction, *Pennsylvania, Costs, Municipal water.
Identifiers: *Reservoir covers, *Pottstown (Penn).

A 200 ft by 300 ft open reservoir was covered in 40 working days, at cost of $65,000 or one-fourth the estimated cost of a solid roof. The material is a specially fabricated, three-ply butyl rubber, nylon. Four in. by 12 in. closed cell floats form a grid approximately 20 ft. by 97 ft. The floats add stability to the center sections of the cover and guide the formation of folds as the water level changes. The folds form at the periphery areas. Rainwater flows to these periphery areas where it can be removed by siphoning or pumping. Before installation of the cover, the reservoir was cleaned with muriatic acid. Tongue and groove joints over the float grid sections provide for cementing fabric panels together. With the installation completed, aluminum coating material was applied to reflect the sun, thereby reducing temperatures and prolonging useful life of the cover, which is guaranteed for a minimum of 15 years. To facilitate cleaning, men can walk on any part of the cover. (Bean-AWWARF)
W73-03456

DRINKING WATER FROM SEWAGE,
Gruenwald Associates, Long Island City, N.Y.
A. Gruenwald.
The American City, Vol 82, No 3, p 92-93, March 1967. 1 tab.

Descriptors: Water supply, *Water treatment, *Reclaimed water, *Water reuse, Sewage, *Filtration, *Activated carbon, Costs, Economics, Sewage effluents, *Potable water.

It is illogical to allow relatively clean effluent from a sewage treatment plant to flow into the ocean - and then construct an expensive desalting plant to make the difficult seawater potable. A good sewage-plant effluent contains only a fraction of the 35,000 ppm of total solids present in sea water, and simple chemical treatment can purify it economically. Desalting, in contrast, commonly employs heat, which is expensive, and the final product is corrosive. The pilot plant process used on effluent from Nassau County's Bay Park Sewage Treatment Plant includes chemical injection followed by sedimentation, filtration in both sand and activated-carbon filters, reaeration and chlorination. From results obtained, the cost of constructing a full-scale facility to purify 2.5 mgd is estimated at $10 million to $12 million. Operating costs for labor, chemicals, power and maintenance (but not amortization) would be about 12 cents per 1,000 gallons. Activated-carbon slurry is injected with the alum solution; after flocculation and settling the clarified liquid is pumped through two sand filters and two granular activated-carbon filters under pressure, all four in series. (Bean-AWWARF)
W73-03457

LET'S UPDATE FILTER-DESIGN STANDARDS,
Black and Veatch, Kansas City, Mo.
J. H. Robinson.
The American City, Vol 82, No 4, p 105-108, April 1967. 2 fig, 5 ref.

Descriptors: *Water treatment, *Standards, *Design, *Filters, Filtration, Flocculation, Sedimentation, Cleaning, Rates, Filters.
Identifiers: Dual-media filters, Multi-media filters, Backwashing, Air-water wash, Filter rates.

Old standards should no longer be applied arbitrarily. With proper pretreatment, the 2 gpm/sq ft filter area can be raised to 6. The tendency in recent years has been to provide such a high degree of treatment that filters serve principally to polish the coagulated water. Dual-bed filters developed in recent years, composed of a coarse layer of crushed anthracite coal over a layer of sand of smaller effective size have gained considerable success. Beds of three media and even four media have been developed. Some studies have shown that, when raw water is relatively clear, the flocculation and sedimentation steps in a conventional treatment plant could be omitted. However, they also indicated that flocculation and sedimentation produced longer filter runs and better effluent water during the winter and when influent turbidities were high. Many plants have adopted the dual-media filters, some the triple-media. Design for washing need not provide a 50 percent expansion of the filter media as optimum scouring of the particles results when the media is just suspended. Several filter plants now under construction will employ an air-water filter wash indicating renewed interest in this process. (Bean-AWWARF)
W73-03458

CONTROL TECHNIQUES FOR COAGULATION-FILTRATION,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. Cincinnati Water Research Lab.
S. A. Hannah, J. M. Cohen, and G. G. Robeck.
Journal of the American Water Works Association, Vol 59, No 9, p 1149-1163, Sept. 1967. 8 fig, 2 tab, 31 ref.

Descriptors: *Water treatment, *Coagulation, *Filtration, *Zeta potential, *Conductivity, *Colloids, *Electrolytes, *Polymers, Electrophoresis, Automation, Temperature, Light intensity, Turbidity.
Identifiers: *Colloid Titration, *Jar tests.

Various monitoring techniques were used to evaluate water quality produced by various dosages of coagulants. Conclusions were: (a) No single monitoring or control procedure tested will serve all purposes, (b) The jar test will continue to be an important aid in control of the coagulation-filtration process. Small laboratory filters are useful in determining initial filterability, (c) Where raw water temperature is low, the jar tests must be run on samples held at the same temperature as in the plant, (d) Measurement of light scattered at 90 deg is a better indicator of haze levels in finished waters, though light scattered at low angles is a better measure of larger particles and therefore a better indicator as to coagulant dosage effects, (e) The electronic particle counter gives a more quantitative evaluation of suspended matter in finished water than turbidity measurement, but is not readily adapted to continuous monitoring, (f) Electrophoretic mobility or zeta potential do not unequivocally pinpoint the best dosage. Experience with a particular water may make it possible to operate satisfactorily by adjusting dosage or pH to a selected particle charge, (g) Final dosage of polymers is best selected through continuous observation of head loss progression and turbidity breakthrough. (Bean-AWWARF)
W73-03459

THE COST OF WATER TREATMENT BY COAGULATION, SEDIMENTATION AND RAPID SAND FILTRATION,
Louis Koenig-Research, San Antonio, Tex.
L. Koenig.
Journal of the American Water Works Association, Vol 59, No 3, p 290-336, March 1967. 4 fig, 24 tab, 7 ref.

Descriptors: *Water treatment, Economics, Costs, *Cost analysis, *Operating costs, *Coagulation, *Sedimentation, *Filtration.

Results are presented of comparative cost engineering audits made on 30 water treatment plants in 1965. Interviews by means of a 10-page checklist, supplemented with sketches of plant facilities and dimensions, are described. Objectives were to determine (a) which elements make up the cost, (b) the relative magnitude of the cost contributed by each differentiable element of the plant, (c) the unit consumption and unit utilization and pertinent design factors for the plants studied, (d) unit costs of selected cost elements - their contribution to the total cost of treatment, (e) the distribution of these operating ratios, design factors, unit prices, unit consumptions, and unit costs among all plants studied, (f) effect of plant size on these ratios, (g) effect of climatic, geographic, or administrative factors on these ratios, (h) effect of water quality parameters on the component costs and total costs of water treatment. (Bean-AWWARF)
W73-03460

EXPERIENCE WITH A MULTIMEDIA FILTER,
Burns and McDonnell Engineering Co., Kansas City, Mo.
M. C. Culbreath.
Journal of the American Water Works Association, Vol 59, No 8, p 1014-1022, Aug. 1967. 5 fig, 2 tab.

Descriptors: *Water treatment, *Filtration, *Flow rates, *Coagulation, *Filters, Flocculation, Sedimentation, Hydrogen ion concentration, Cleaning.
Identifiers: *Dual media filters, Pilot filters, Coagulant aids.

Rapid sand filtration and Multimedia filtration were compared. Conclusions were: (a) The operators need more education on the multimedia process. (b) The cost of producing water is about the same for both processes. (c) Multimedia filter runs at 9 mgd rate (design rate 6.25 mgd) seem to be limited by either an excess amount of filter aid or the lime fed for pH adjustment. (d) Settled water can be processed with turbidities up to 100 ppm to produce a filter effluent of 1 ppm. Therefore sufficient aid must be added to insure an acceptably clear effluent. (e) Proper use of the surface wash system lowers the initial loss of head after washing. (f) Coagulant control center 'pilot filters' must be used during periods of high turbidity. (Bean-AWWARF)
W73-03461

FILTERABILITY TECHNIQUES FOR IMPROVING WATER CLARIFICATION,
Philadelphia Surburban Water Co., Bryn Mawr, Pa.
K. E. Shull.
Journal of the American Water Works Association, Vol 59, No 9, p 1164-1172, Sept. 1967. 3 fig, 16 ref.

Descriptors: *Water treatment, *Coagulation, *Filtration, *Colloids, Electrophoresis, *Zeta potential.
Identifiers: *Jar tests.

Various techniques are used in the water treatment field to determine the control of coagulation-filtration. Colloids, electrophoretic mobility and zeta potential, its measurement and significance in water treatment are discussed. The determination of coagulant dosage by jar tests, methods for determining the optimal ZP, the filterability curve, the requirements for successful testing, stirring times required of the importance of jar tests also are discussed. Specific procedures or techniques are presented for jar tests and plant control. (Bean-AWWARF)
W73-03462

THEORY OF WATER FILTRATION,
North Carolina Univ., Chapel Hill.
C. R. O'Melia, and W. Stumm.
Journal of the American Water Works Association, Vol 59, No 11, p 1393-1412, Nov. 1967. 7 fig, 1 tab, 56 ref.

Descriptors: *Water treatment, *Chemical reactions, *Electrodialysis, *Adsorption, *Sedimentation, *Diffusion, *Filtration.
Identifiers: Transport mechanism, Aging effects, Bridging.

Physical filtration theories, utilization and limitations of equations, chemical filtration theories, Ives' and Gregorys' theories, the transport step, transport mechanism insights, the attachment step, applying the double layer model, special chemical interactions, aging effects, applying the bridging model, and various investigations are discussed. Possible causes for lack of agreement among filtration theories are suggested. (1) Water filtration is affected by both physical and chemical parameters. Therefore, investigations of the effects of physical parameters can only be compared if effects of chemical parameters are constant, and vice versa. (2) There are no grounds for assuming that only one transport mechanism is significant in water filtration. Ives has suggested that gravitational settling and diffusion can be significant. (3) Similarly, there are no grounds for assuming that diffuse layer interactions are the only colloid chemical forces controlling particle attachment. (Bean-AWWARF)
W73-03463

STUDIES ON THE REMOVAL OF ACTINOMYCETE MUSTY TASTES AND ODORS IN WATER SUPPLIES,
Iowa Univ., Iowa City. State Hygienic Lab.
J. D. Dougherty, and R. L. Morris.
Journal of the American Water Works Association, Vol 59, No 10, p 1320-1326, Oct. 1967. 5 fig, 5 tab, 8 ref.

Descriptors: *Water treatment, *Actinomycetes, *Taste, *Odor, Chlorination.
Identifiers: *Mucidone.

Considerations of organic chemistry predict that the chemically reactive part of mucidone is the oxygenated ring. Experiments have shown that with relatively large amounts of certain oxidants this ring can be opened and oxidized to a carboxylic acid which affords a means of greatly reducing the volatility (lowering the threshold odor number) of this compound. The first point of oxidative attack is the carbon-carbon double bond when reagents such as potassium permanganate are employed. This reactive site is also involved with other agents under favorable pH conditions. In dilute solutions this reaction takes place with a reasonable contact time; some reactions are 90 percent complete within thirty minutes. Oxidation with low concentrations of chlorine takes place more slowly than with permanganate. It is assumed that the rate of extended oxidation required to reduce the volatility of this material is too slow under chlorination procedures usually employed in water treatment plants. The data presented are intended to show that chemical compounds having structures similar to mucidone may be quite resistant to chemical oxidation using dosages and times that are practical. It is logical to assume, therefore, that physical adsorption methods would be the most successful when dealing with these compounds. (Bean-AWWARF)
W73-03464

DESIGN OF MIXING AND FLOCCULATING BASINS,
Hazen and Sawyer, New York.
H. E. Hudson, Jr., and J. P. Wolfner.
Journal of the American Water Works Association, Vol 59, No 10, p 1257-1267, Oct. 1967. 12 fig, 1 tab, 9 ref.

Descriptors: *Water treatment, *Design, *Flocculation, *Mixing, Velocity, Time, Hydrolysis, Sedimentation, Filtration.
Identifiers: *Short circuiting.

Rapid mixing, flocculating criteria, handling flocculated water, velocity gradients, short circuiting, types of flocculators, and effects on water quality are discussed. Preparation of water for filtration can have a greater effect on effluent quality than variables in the filtration process. Deficiencies in coagulant dosage or improper chemical treatment, insufficient mixing or flocculating time or intensity, failure to disperse the coagulant rapidly before hydrolysis and polymerization, and short-circuiting in mixing and flocculation chambers can all result in a residual concentration of turbidity, suspended matter, bacteria, color or residual alum. Each of the preceding factors is a matter of design except for chemical treatment which is in the hands of the operator. Design deficiencies in an existing plant can often be corrected by altering the point of application of chemicals, compartmenting flocculation chambers into series operation to reduce short circuiting, or increasing flocculating intensity or time. Settling basin short circuiting can be reduced by the installation of effective permeable baffle inlets. Criteria for design and operation are stated, and graphic solutions for computation of velocity gradients are presented, together with illustrative data on the measurement and effects of short-circuiting. Characteristics of flocculation devices are reviewed. (Bean-AWWARF)
W73-03465

ELECTROKINETIC BEHAVIOR OF ALUMINUM SPECIES IN DILUTE DISPERSED KAOLINITE SYSTEMS,
Florida Univ., Gainesville.
A. P. Black, and C. Chen.
Journal of the American Water Works Association, Vol 59, No 9, p 1173-1183, Sept. 1967. 7 fig, 6 tab, 22 ref.

Descriptors: *Water treatment, *Aluminum, *Coagulation, *Colloids, *Flocculation, *Clays, *Kaolinite, Adsorption, Zeta potential.
Identifiers: *Destabilization.

Studies were made at pH 3, pH 5, and pH 8, attempting to elucidate the specific electrokinetic behavior of the trivalent aluminum ion, Al+++, polymeric multivalent aluminum ion species, and insoluble aluminum hydroxide in the destabilization of dilute kaolinite clay suspensions. The behavior of the trivalent aluminum ion in the destabilization of of a dispersed clay system is to compress and reduce the thickness of the electrical double-layer of the clay particle, reducing both the zeta potential and the Stern potential of the clay particle. Destabilization of kaolinite clay suspensions at pH 5 can be attributed to a reduction of the zeta potential through specific adsorption of the polymeric multivalent ions onto the clay surface with subsequent reduction, and even reversal, of the surface potential of particles. Physical enmeshment may account for the behavior of aluminum hydroxide in the destabilization of kaolinite clay suspension at pH 8 when concentration of the aluminum ions exceed 1.2 x 10-4M. At lesser concentrations a mechanism of mutual flocculation between positively charged aluminum hydroxide colloids and negatively charged clay particles best describes the destabilization. (d) The Freundlich adsorption isotherm was found to describe best the adsorption of the polymeric multivalent aluminum ions by the kaolinite clay particles. (Bean-AWWARF)
W73-03466

APPLYING SHALLOW DEPTH SEDIMENTATION THEORY,
Neptune Microfloc, Inc., Corvallis, Oreg.
S. P. Hansen, and G. L. Culp.
Journal of the American Water Works Association, Vol 59, No 9, p 1134-1148, Sept. 1967. 11 fig, 7 tab, 11 ref.

Descriptors: *Water treatment, *Sedimentation, *Filtration, *Sludge, *Turbidity, *Flow-rates, *Economics.
Identifiers: Tube settling, Mixed media filters.

Laboratory and field tests have shown that the tube settling process for sedimentation is technically feasible. Sludge removal and flow distribution problems can be overcome in the tube settling process. Relatively small diameter tubes (1-4 in.) 2-4 ft. in length provide efficient sedimentation with detention times of 6 min. or less. Tube length, diameter, and flow rate, the nature of the incoming settleable material, and the nature and quantity of the chemicals added affect the performance of the tube settler. The tube settler provides settled water quality compatible with the filtration capabilities of the mixed media filter at filter rates in excess of 5 gpm/sq. ft. Inclining the tubes slightly in the direction of flow permits sludge removal by gravity drainage, eliminating need for mechanical sludge removal equipment. The use of small-diameter tubes allows proper flow distribution to be readily achieved by maintaining proper tube-reservoir inlet and outlet conditions. In cases where settling is required prior to mixed-media filtration, the tube-settler, high-rate filter combination greatly reduces the space requirements and cost for the water treatment facility. The tube settling process allows the long recognized advantages of shallow depth sedimentation to be applied in a practical manner. (Bean-AWWARF)
W73-03467

STUDY OF THREE-PHASE WATER TREATMENT FOR KANSAS CITY, MISSOURI,
Kansas City Water Dept., Mo.
J. R. Popalisky, and F. Pogge.
Journal of the American Water Works Association, Vol 59, No 9, p 1121-1133, September 1967. 3 fig, 6 tab, 6 ref.

Descriptors: *Water treatment, Water quality, *Organic matter, *Oxidation, *Chlorination, *Odor, Sedimentation, Water softening, Toxicity, Groundwater, *Missouri.
Identifiers: *Kansas City (Mo), Well water blending.

With presedimentation and two-stages of treatment, the Kansas City, Mo. treatment plant is able to produce exceptionally high quality drinking water at least 90 percent of the time; however, the consumers are demanding a high quality product all of the time. Reasons the river water is more difficult to treat than in the past are given. Studies show that significant improvements would result from use of oxidants and well water blending in the stage before softening. These improvements would result from (a) Continuous breakpoint chlorination, effective in removing microorganisms, (b) Potassium permanganate treatment, which exhibited the best organic removal, with a corresponding lower odor level, though limited potential for removal of microorganisms, (c) Well water blending with the river water eliminated the need for addition of coagulants to the secondary basin, due to the high contribution of cations in the well water. The third stage should provide for continuous chlorination of the raw water to free chlorine residual, intermittent application of potassium permanganate, and intermittent blending of well water with the Missouri River water. (Bean-AWWARF)
W73-03468

HETEROTROPHIC IRON-PRECIPITATING BACTERIA,
Illinois Univ., Urbana.
F. M. Clark, R. M. Scott, and E. Bone.
Journal of the American Water Works Association, Vol 59, No 8, p 1036-1042, August 1967. 2 tab, 16 ref.

Descriptors: *Water treatment, *Water quality, *Iron, *Iron bacteria, Ammonium compounds, Aerobic bacteria, Pseudomonas, Distribution systems.
Identifiers: *Iron precipitation, *Carbon utilization, *Capsules, Aerobacter, Serratia indica, Bacilli pumulus.

The bacterial deposition of iron in water has been credited largely to the filamentous iron bacteria Crenothrix and Leptothrix, and the stalk forming Gallionella. It has become increasingly apparent that biological iron deposits in water are probable even though 'iron bacteria' cannot be demonstrated. Non-filamentous heterotrophic bacteria with the ability to cause iron precipitation were isolated from water, in a ferric ammonium citrate medium. Aerobacter aerogenes was the most commonly encountered, especially in surface water. Others were Serratia indica, Pseudomonas and Bacillus pumilus. All these had two characteristics in common, the ability to utilize citrate as a carbon source, and the production of capsular material. Microscopic observations showed a large capsule which appeared to be encrusted with iron. The 'yellow acids', or tannins and humins, leached from leaves, bark and dead vegetation, are important chelating agents that may keep iron in non-precipitable state for several weeks, at pH even as high as 9.5. Some bacteria use the carbon from these iron complexes during metabolism, leaving the iron remains fixed in the capsule. These bacteria then settle out as a slime or precipitate. This could explain the 'zoogleal masses' of encapsulated bacteria encrusted with iron often observed in water supplies. (Bean-AWWARF)
W73-03469

RESEARCH COMMITTEE ON COLOR PROBLEMS.
American Water Works Association, New York. Research Committee on Color Problems.

Journal of the American Water Works Association, Vol 59, No 8, p 1023-1035, August 1967. 2 tab, 45 ref.

Descriptors: *Water treatment, *Water quality, *Color, *Chemical properties, *Chemical reactions, Chemical degradation, Electrophoresis, Organic matter, Coagulation, Hydrogren ion concentration, Research priorities.
Identifiers: *Coagulants.

The origin of color in water is discussed. Chemical structure and significance of color; chemical nature and degradation; coagulation of organic color with relation to pH, choice of coagulants, coagulation theory and electrical hypotheses are discussed. Research needs are identified in seven specific areas. (1) Chemical structure of organic color. (2) Variations of chemical structure with source of colored water. (3) Biogenesis of color. (4) Particle size of color macro-molecules. (5) Mechanism of color coagulation. (6) Analytic techniques for color determination. (7) Color-metal interaction. (Bean-AWWARF)
W73-03470

APPLICATION OF COLLOID TITRATION TECHNIQUE TO FLOCCULATION CONTROL,
Burgess and Niple Ltd., Columbus, Ohio.
S. Kawamura, G. P. Hanna, and K. S. Shumate.
Journal of the American Water Works Association, Vol 59, No 8, p 1003-1013, Aug 1967. 13 fig, 7 ref.

Descriptors: *Water treatment, *Water purification, *Colloids, *Electrophoresis, *Zeta potential, *Flocculation, Sedimentation, Coagulation, Alkalinity, Turbidity.
Identifiers: Isoelectric point.

Destabilization of colloidal systems is a widely used process in water purification for the flocculation and precipitation of color or turbidity. At present electrophoretic mobility is considered the best means of determining the charge characteristics of colloidal particles. Zeta potential, one of the primary factors of colloid stability, may be calculated from the migration velocity of colloidal particles, or alternately, the migration velocity itself may be used as a measure of the stability of the system. However, determination of the migration speed of a significant number of particles is time consuming and difficult, requiring skill, experience and specialized apparatus. By use of the colloid titration technique, it is possible to develop a reliable relationship between raw water colloids charges, total alkalinity, and optimum coagulant dosage. Also, to determine dosage needed to attain the isoelectric point of a given raw water. The ease and rapidity with which it is carried out, without specialized equipment, makes it especially attractive where the raw water qualities are subject to rapid fluctuation. (Bean-AWWARF)
W73-03471

CORROSION OF METALS IN POTABLE WATER SYSTEMS,
Michigan State Univ., East Lansing. Coll. of Engineering.
M. F. Obrecht, and M. Pourbaix.
Journal of the American Water Works Association, Vol 59, No 8, p 977-992, Aug 1967. 14 fig, 2 tab.

Descriptors: *Water treatment, *Water quality, *Corrosion control, Silicates, Phosphates, Lime, Alkalinity.

Corrosion control in potable water systems for all metals can be obtained by proper chemical treatment balance using nontoxic chemicals. Vrious chemicals such as synthetic silicates, complex phosphates, and alkalinity or hardness control chemicals, have been used for this type of corrosion control. Such chemicals must be properly administered to produce the desired corrosion protection and protect public health. This requires careful engineering of feed systems (good routine analytical tests by trained personnel). Efficiency of corrosion protection can be evaluated by proper monitoring and testing throughout the entire potable water system. Ultimate answers for the solution of corrosion of metals in potable water can be reached by combining very careful laboratory studies along the lines presented herein, basic experiments on the kinetics of all reactions involved in the corrosion processes, good pilot field studies, and observations. (Bean-AWWARF)
W73-03472

REMOVAL OF IRON FROM GROUND WATER BY FILTRATION,
Jadavpur Univ., Calcutta (India).
M. M. Ghosh, J. T. O'Connor, and R. S. Englebrecht.
Journal of the American Water Works Association, Vol 59, No 7, p 878-896, July 1967. 10 fig, 6 tab, 12 ref.

Descriptors: *Water treatment, *Iron compounds, *Groundwater, *Oxidation, *Nitrification, *Chlorination, Aeration, Sedimentation, Filtration.
Identifiers: *Iron removal.

In pilot plant studies of iron removal from well water it was found possible to convert the soluble ferrous iron to either ferric or an insoluble ferrous state, presumably $FeCO_3$, by aeration and detention. When a concentration of DO could be maintained in the effluent and there was no excessive biological growth in the filters, the removal of iron was quite satisfactory. After a period of several weeks biological growths in some filters produced nitrification and some ferric iron was reduced to ferrous form and passed to the effluent. Nitrification in the filter was effectively eliminated by using thiourea for nitrosomonas, at a rate of 7.6 ppm. With continuous feed of such, it was possible to restore the filter to normal efficiency. Chlorination would not prevent the nitrification unless the dosage approached the stoichiometric requirements for oxidation of the ammonia present. However, occasional superchlorination of the backwash water followed by continuous chlorine feed may satisfactorily control the biological growths and iron reduction. (Bean-AWWARF)
W73-03473

EXPERIENCES WITH DIATOMITE FILTRATION IN NEW YORK STATE,
New York Department of Health, Albany. Water Supply Section.
S. Syrotynski.
Journal of the American Water Works Association, Vol 59, No 7, p 867-877, July 1967. 3 fig, 4 tab.

Descriptors: *Water treatment, *Diatomaceous earth, *Filtration, *Algae, Turbidity, Crustaceans, *New York.
Identifiers: *Filter cake, Body feed.

Survey data were collected at municipal diatomite filter plants in New York state. Conclusions include: (a) Turbidity or total color has no consistent relationship to total microscopic count. (b) Total iron content of water examined increased with increased total counts. (c) Total counts on effluent waters showed no relationship to influent loading. (d) Rapid increase in total counts in raw water can be treated if continuous or frequent monitoring is practiced. (e) A minimum initial body feed to turbidity ratio of 3:1 appears to be significant in maximizing the time of cycle in an approximate total count range of 300-5,000 su/ml. (f) Occurrence of large numbers of crustacea (over 1,000 su/ml) suggests that a body feed level of 50 ppm will be insufficient to produce maximum output. (g) For filtration systems using cylindrical element design, cycle progression results in increased filtration area and decreasing filtration rates. (h) There appears to be no objection to filtration rates greater than 1 gpm sq/ft. for low total count and low turbidity waters. (i) Total count parameter is a better measure of head loss contribution than turbidity when clay and silt are not present in appreciable amounts. However, the total count parameter cannot be relied upon because of the high degree of competency required in performing this test. (Bean-AWWARF)
W73-03474

FOAM SEPARATION METHOD FOR THE CLARIFICATION OF NATURAL WATERS,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
R. B. Grieves.
Journal of the American Water Works Association, Vol 59, No 7, p 859-866, July 1967. 5 fig, 2 tab, 9 ref.

Descriptors: *Water treatment, *Water purification, *Foam separation, Coagulation, *Surfactants, Turbidity, Separation techniques.

This study is part of an effort to develop a new technique for the clarification of highly turbid waters. The foam process involves the addition to the raw water of a cationic surfactant which is adsorbed at the surfaces of the particles that constitute turbidity or apparent color. The oleophilic particles are then floated to the water surface in a foam phase rising above the water surface. Much research work remains to be done on the toxicity of surfactants. Several natural waters, including those to which sediment had been added, were clarified satisfactorily by foam separation. Dosages ranged from 10 to 60 ppm according to the turbidity of the raw water. Three quaternary ammonium salts gave similar results. Bentonite clay as a floatation aid permitted some reduction

in surfactant dosage. Concentration of residual surfactant was 0.5 ppm. (Bean-AWWARF)
W73-03475

MEASUREMENT OF FLOC STRENGTH BY PARTICLE COUNTING,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. Cincinnati Water Research Lab.
S. A. Hannah, J. M. Cohen, and G. G. Robeck.
Journal of the American Water Works Association, Vol 59, No 7, p843-858, July 1967. 11 fig, 1 tab, 19 ref.

Descriptors: *Water treatment, *Electrolytes, *Flocculation, *Filtration, Head loss, Coagulation, Sedimentation.
Identifiers: *Coagulant aids.

Floc strength or toughness may be defined as resistance to fragmentation by shear forces induced by hydraulic gradients. Several attempts have been made in the past to measure floc strength using turbidimetric or photographic methods for evaluation. This study, using a Couette mixer and particle counter, provides some insight into the dynamic nature of flocculation, and a qualitative estimate of the tendency of floc to fragment. Conclusions were: (1) The highest rate of flocculation does not necessarily produce a floc most resistant to shear. (2) Alum floc alone is relatively weak and is apparently strengthened by incorporating solids into the floc. (3) Sodium tripolyphosphate, if present when alum is added, may completely inhibit flocculation, but only slowly disperses an already formed alum floc. (4) The coagulant aids have a promounced effect upon the formation of large strong floc, but limited dosages must be employed as floc strength must be tailored to fit the overall treatment porcess. This includes filtration, which may be adversely affected by a very high floc strength. (Bean-AWWARF)
W73-03476

CONSUMER ATTITUDES TOWARD MINERAL TASTE IN DOMESTIC WATER,
California Univ., Berleley. School of Public Health.
W. H. Bruvold, H. J. Ongerth, and R. C. Dillehay.
Journal of the American Water Works Association, Vol 59, No 5, p 547-556, May 1967. 2 fig, 4 tab, 15 ref.

Descriptors: *Water treatment, *Mineral water, *Taste, *Water quality, *Public health.
Identifiers: Consummer attitudes.

Standards are needed to determine if existing water supplies are potable as well as how much mineral should be removed from brackish waters. Two scales were constructed, using the method of equal appearing intervals, to measure consumer attitude toward the taste of water. The first, called the attitude taste scale (ATS), comprises 25 items. The second was labeled the attitude adjective taste scale (AATS). It comprised 34 adjectives evaluating the taste of water. Each item was assigned a numerical score value. Surveys were made in six cities (California) with 220 total respondents. These six public supplies contained ranges of minerals from 50 to 1,401 ppm total dissolved solids, 8 to 192 ppm calcium, 1 to 67 ppm magnesium, 2 to 113 ppm, sodium, 2 to 82 ppm chloride, and 2 to 659 ppm sulfates. The content of each mineral increased in the same order in each of the six waters. Research is necessary to determine whether the quality and presence of dissolved minerals may be a more satisfactory method than the threshold taste approach to the establishment of limiting standards for minerals in water. (Bean-AWWARF)
W73-03477

STATUS OF FLUORIDATION IN THE UNITED STATES AND CANADA, 1965.
American Water Works Association, New York. Task Group 2620P.

Journal of the American Water Works Association, Vol 59, No 4, p 440-445, April 1967. 9 tab.

Descriptors: *Water treatment, *Fluoridation, *Fluorides, *Public health, *Canada, *United States.

By the end of 1965, fluoridation was practiced by 3,030 communities in the U.S. and 272 in Canada; an increase during 1965 of 272 in the U.S. and 29 in Canada. Population served was almost 60 million in the U.S. and 4.7 million in Canada. Approximately 10.1 million people in the U.S. also receive water containing natural fluorides of over 0.7 ppm. Tables show how fluoridation was authorized and the percent of communities in various states receiving fluoridated water, also the populations receiving such in each state. Several consolidated school water supplies are now being fluoridated up to a level of 5 ppm, which has been found effective. This is safe since children arrive at school at an age too old to produce mottling of their teeth. (Bean-AWWARF)
W73-03478

THE TECHNOLOGY OF PURE WATER.
Industrial Water Engineering, Vol 6, No 11, p 16-29, Nov 1969. 10 fig, 3 tab, 9 ref.

Descriptors: *Water treatment, *Water quality, *Standards, *Filtration, *Activated carbon, *Ion exchange, Hydrogen ion concentration, Water purification.

The generalized concept of what constitutes pure water has changed by a factor of ten over the past 20 years, and tolerance limits for certain specific impurities have moved from the ppm to the ppb range. Today, ultra-pure water is being produced by various industries at rates exceeding a million gallons per day. Methods of removing 12 classifications of impurities are detailed with methods of analysis indicated. Topics discussed include experience in the production of ultra-pure water; measuring impurities in ultra-pure water; problems encountered with preparation of ultra-pure water; and externally regenerated condensate demineralization for once-through steam generators. Water specifications and purification for water cooled power reactors; pure water for the pharmaceutical industry; recirculation or treatment at point of use; control of an ultra-pure water system; and ultra-pure water, theoretical purity, practical purity, common impurities and their general sources also are discussed. (Bean-AWWARF)
W73-03479

ECONOMIC FACTORS IN WATER TREATMENT,
Crane Co., King of Prussia, Pa. Cochrane Div.
G. J. Crits.
Industrial Water Engineering, Vol 8, No 8, p 22-29, Oct/Nov 1971. 4 tab.

Descriptors: *Water treatment, Water quality, Economics, *Cost comparisons, *Filtration, Ion exchange, Coagulation, Activated carbon, Demineralization, Resins, Reverse osmosis, Organic matter.
Identifiers: *Activated carbon filters.

A comparative analysis is presented of the costs and capabilities of various equipment and processes used to treat water. Tables show the cost of equipment for 17 different processes, the main constituents affected, the extent of changes produced, relative skill required to operate, and costs per 1,000 gal produced. Filtration; cooling tower filters; filters ahead of ion-exchangers; ultra quality water; clarifier versus pressure in-line coagulation; and activated carbon filters are discussed. Organic traps, demineralizer-organic trap system; RO in the electronics industry; leakage; high-pressure boiler condensate; carbon mixed-bed demineralizers; reverse osmosis; and septum filters and resin filters also are discussed. (Bean-AWWARF)
W73-03481

OZONATION TODAY,
Water Treatment Corp. City of Industry, Calif.
M. Ogden.
Industrial Water Engineering, Vol 7, No 6, p 36-42, June 1970. 2 fig, 1 tab.

Descriptors: *Water treatment, *Public health, *Ozone, *Chlorine, *Disinfection, Pathogene bacteria, Slime, Waste water treatment.

In America ozone has not acquired the popularity of chlorine, though it is a more powerful oxidizing agent, with fewer associated side-effects. This was due to the bulk and cost of early equipment, but modern ozonators could change this situation. Comparative oxidizing potential of water disinfectants has been calculated as: ozone 2.5, chlorine 1.3, chlorine dioxide 1.25, chloramine 0.9. The ability of small dosages of ozone to achieve absolute control of all pathogens and saprophytic organisms in water is unquestioned. Basic ozone hardware and modern ozone hardware are discussed, also ozone use in the bottling industry, in pharmaceutical houses and hospitals, in the control of slimes and scale in cooling waters, and its developing use in wastewater treatment. The practicality of producing reusable water by ozonation of clarified secondary effluents from tricklingfilter waste treatment plants is discussed. The post-ozonation water was sterile, virtually free of color, odor, turbidity, and surface-active detergents, and had COD below 15 ppm. (Bean-AWWARF)
W73-03482

CONTROL OF ALGAE WITH VIRUSES,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
R. S. Safferman, and M. E. Morris.
Journal of the American Water Works Association, Wol 56, No 9, p 1217-1224, September 1964. 3 fig, 2 tab, 17 ref.

Descriptors: *Water treatment, *Algae, *Viruses, Copper sulfate, Chlorine, *Algal control.

Currently, the control of algae growths is almost entirely dependent upon the use of copper sulfate and chlorine, although neither agent is selectively toxic or completely effective. The isolation of algae virus (BTA virus LPP-1); its propagation, the effects of the virus and its multiplication, the control of dense growths of algae, the stability of the virus, and bacteriophage ecology are discussed. Data obtained show that the destructive power of the BGA virus could serve as a highly potent and selective algae control, thus making it possible to eliminate use of the chemicals that are presently employed in the treatment of algae problems. The stability of the BGA virus appears to correspond closely to the growth pattern of its algal host. Because of the highly selective nature of viruses, it seems unlikely that the agent would infect other plants or animals. Consequently, no toxicity problem should be encountered upon treatment of water supplies with such agents. (Bean-AWWARF)
W73-03483

STREAMING POTENTIALS IN DIATOMITE FILTRATION OF WATER,
Iowa State Univ., Ames.
C. S. Oulman, and E. R. Baumann.

Journal of the American Water Works Association, Vol 56, No 7, p 915-930, July 1964. 5 fig, 13 tab, 6 ref.

Descriptors: *Water treatment, *Filtration, *Diatomaceous earth, *Colloids, *Electrolytes, *Zeta potential, Filters.
Identifiers: *Streaming potential, *Filter aids, *Ferric coagulant, *Diatomite filters.

The zeta potential (ZP) of flux-calcined diatomite filter aid is negative. Electropositively coated grades of diatomite have been chemically treated with aluminum salts by a patented process that imparts a positive charge to the diatomite. The ZP of a filter aid can be determined from streaming potential measurements made while filtering distilled or deionized water, but cannot be determined while filtering natural waters because of their low resistivity. The potentials determined while filtering distilled or deionized water are useful for determining the amount of chemical needed for reversing the ZP of diatomite filter aids. The true ZP of diatomite in filter cakes is related to the kind of cations in the water. Sodium ions do not change the ZP of the filter aid; magnesium and ferrous ions make the ZP less negative; aluminum and ferric irons and cationic electrolytes may reverse the ZP and temporarily make it strongly positive. Ferric salts are less effective for producing an electropositively charged diatomite filter aid. (Bean-AWWARF)
W73-03484

EFFECT OF CONTROL SYSTEMS ON FILTER PERFORMANCE,
New York Air Brake Co., Providence, R.I.
M. E. Rogers.
Journal of the American Water Works Association, Vol 56, No 7, p 907-914, July 1964. 7 fig, 9 ref.

Descriptors: *Water treatment, *Water quality, *Filtration, *Control, *Design, Flow rates, Head loss, *Filters.

Current filter design and operating trends are toward higher unit filter rates and wider flow variations through filters. To prevent deterioration of effluent quality from inherent or induced surges at these higher rates, control systems must provide stable performance. Items entering into a flow-control loop must be carefully selected. Some guidelines are provided which will assist the designer in his selections. Manufacturers now have designs available which completely fulfill the criteria presented. The effect of rate controllers, filter effluent control systems, flowmeter instruments, primary devices, limits of permissible error, control values and valve actuation are discussed. (Bean-AWWARF)
W73-03485

EFFECT OF IMPURITIES ON PRECIPITATION OF CALCIUM,
Oak Ridge National Lab., Tenn.
E. Schonfeld.
Journal of the American Water Works Association, Vol 56, No 6, p 767-773, June 1964. 2 tab, 14 ref.

Descriptors: *Water treatment, *Calcium carbonate, *Magnesium hydroxide, Sodium compounds, Phosphates, Fluorides, Ammonium salts, *Water pollution treatment.
Identifiers: Cleaning agent, Ferric coagulant, Sodium sulfonate, EDTA.

Precipitation of calcium carbonate from water adjusted to 0.01 M in NaOH is seriously inhibited by the presence of 1-1.5 ppm of hexametz, pyro, or ortho-phosphates, and 3 ppm decontaminating agent or cleaning formulation. Tripoly-phosphate had a small inhibitory effect. The inhibitory effect of phosphate on calcium precipitation may be overcome by adjusting in Na2CO3 solution with ferric iron. Seed crystals are beneficial also. The following impurities, at concentrations noted, do not interfere: pure detergent sodium dodecylbenzene sulfonate, 2-50 ppm; fluoride, 7 ppm; ammonium oxolate, 3 ppm; and EDTA, 10 ppm. Precipitation of magnesium hydroxide was not inhibited by any of the impurities under the test conditions. Precipitation of calcium as the phosphate from water adjusted to 0.004 M in NaOH was not inhibited by any of the impurities though the precipitate was composed of smaller slower settling particles than from precipitation of ca'cium as carbonate. (Bean-AWWARF)
W73-03486

QUALITY AND COST EVALUATION OF TREATMENT PROCESSES FOR A SPECIFIC WATER,
East Bay Municipal Utility District, Oakland, Calif.
L. E. Hanson.
Journal of the American Water Works Association, Vol 56, No 5, p 535-542, May 1964. 1 fig, 3 tab, 10 ref.

Descriptors: *Water treatment, *Water quality, *Cost analysis, *Design, *Filtration, Diatomaceous earth, Head loss, Sedimentation.
Identifiers: Dual-media filters, Filter aid, Microstraining.

Study indicated that filters of sand, anthracite, or sand-anthracite could all produce a satisfactory effluent at nearly equal cost and at lower cost than that of other methods studied. Diatomaceous-earth filters are not competitive in the situation studied because they require the continuous feeding of a filter aid, whereas the study costs for other processes were based on no chemical use except chlorine except during periods of high turbidity or high plankton count. Microstrainers do not offer any economic advantage and their effectiveness under conditions of high turbidity is doubtful. Improvement of quality and increased length of filter runs gained by pretreatment with conventional or high-rate sedimentation were not considered sufficient to justify the 30-35 percent total cost increase over rapid sand filters alone. Similarly, the improved filter runs that would be provided by microstrainers ahead of sand filters could not justify the 50 percent cost increase. It was decided to include rapid sand filters in the design of the new plant. These can be easily converted to anthracite or sand-anthracite, or pretreatment can be added if subsequent developments prove these processes to be advantageous. (Bean-AWWARF)
W73-03487

REMOVAL OF HYDROGEN SULFIDE WITH POTASSIUM PERMANGANATE,
Elgin Softener Corp., Elgin, Ill.
B. F. Willey, H. Jennings, and F. Muroski.
Journal of the American Water Works Association, Vol 56, No 4, p 475-479, April 1964. 3 fig, 2 tab, 5 ref.

Descriptors: *Water treatment, *Hydrogen sulfide, *Sludge, *Hydrogen ion concentration, Filters.
Identifiers: *Permanganate, *Greens and filters.

Reactions occurring when hydrogen sulfide-bearing waters are treated with potassium permanganate with or without the presence of iron manganese were investigated. Hydrogen sulfide can be effectively removed from water with a continuous regeneration process consisting of a continuous feed of potassium permanganate to the influent of a manganese green-sand filter. Limitations exist in the quantity of sludge produced and amount of backwash required. Acid feed and aeration markedly reduce the permanganate demand and cost. Degasification and retention reduce filter load and backwash required while improving filter efficiency and operating economy. Data indicate that each ppm of hydrogen sulfide requires approximately 6.2 ppm of permanganate for oxidation to a stable endpoint when sulfide-bearing well waters are treated at essentially neutral pH values and normal ground water temperatures. Two-thirds of the sulfides are converted to sulfates. It is assumed that the remainder is converted to insoluble sulfur probably absorbed in the floc formed. (Bean-AWWARF)
W73-03488

EFFECTIVENESS OF POTASSIUM PERMANGANATE FOR DISINFECTION,
Iowa State Univ., Ames. Dept. of Civil Engineering.
J. L. Cleasby, E. R. Baumann, and C. D. Black.
Journal of the American Water Works Association, Vol 56, No 4, p 466-474, April 1964. 7 fig, 2 tab, 27 ref.

Descriptors: *Water treatment, *Disinfection, *Coliforms, *Chlorination, Organic matter, Hydrogen ion concentration, Iron, Manganese, Taste, Odor.
Identifiers: *Permanganate.

The study was performed to obtain information on the effectiveness of potassium permanganate as a disinfectant against the common enteric bacteria. It was found that, (1) in the range of 0C to 20C slightly greater kill is obtained at the higher temperatures, (2) the major factor affecting effectiveness in pH. A pH of 5.9 is more effective than 7.4 or 9.2, therefore in natural waters with pH of 5.9 or less permanganate should be efficient, (3) the bacterial kill does not follow Chick's law. Because permanganate has a strong affinity for organic matter a constant disinfection rate would not be found for natural waters and tests are necessary before estimating the efficiency of any dosage, (4) permanganate is not a good post-disinfectant because brown stains produced by manganese dioxide prevent use of a residual in a distribution system, (5) at pH 5.9-7.4 permanganate concentrations of 4-16 ppm have significant disinfecting power. When taste, odor, iron or manganese are present in any water, permanganate should be considered, since it may aid removal of all and reduce chlorination needs. (Bean-AWWARF)
W73-03489

REVIEW OF ANTICORROSION WATER TREATMENT,
Lansing Board of Water and Light, Mich.
J. F. Dye.
Journal of the American Water Works Association, Vol 56, No 4, p 457-465, April 1964. 10 ref.

Descriptors: *Water treatment, *Corrosion, *Calcium carbonate, *Water softening, Aeration, Zeolites, Lime.
Identifiers: *Greensand filters, *Calcite coating, McCauloys method, Marble test.

Methods used to protect pipelines from corrosion, the indexes used to measure the forces of corrosion, and treatments uded for anticorrosion at Fairmont, Minn., Omaha, Neb., Council Bluffs, Iowa and Lansing are discussed. The best treatment of softened waters consists of maintaining a driving-force index (DFI) of 15-20 and a momentary excess (ME) of 12-15 in conjunction with low calcium and high carbonate ion concentrations. In the pH range of 9.5-10.0 a rough indication is an saturation index (SI) of 1.0 or even more. Such waters would plug mains, therefore 0.5 ppm polyphosphate should be applied. After pH reduction by alum coagulant, the pH of soft surface waters should be increased to 8.8-9.0, as a DFI and ME of sufficient magnitude would thereby be obtained to give the protection desired. Aerated and lime-softened well waters require the same treatment as lime-softened surface waters. Oxygen-free, lime-softened well waters can probably be treated to ME values of 12-15, but to a lower DFI. (Bean-AWWARF)

W73-03490

RELATION OF RAW-WATER QUALITY TO TREATMENT PLANT DESIGN,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
R. L. Woodward.
Journal of the American Water Works Association, Vol 56, No 4, p 432-440, April 1964. 24 ref.

Descriptors: *Water treatment, *Water quality, *Design, *Viruses, Disinfection, Chlorination, Coagulation, Sedimentation, Activated carbon, Organic matter, *Treatment facilities.

The effectiveness of various treatment processes and possibilities of variable results are discussed. Published studies have shown that well-designed and well-operated plants can produce virtually coliform free water though the raw water contains organism concentrations at higher than recommended limits. Uncertainty about the significance of viruses and organic chemical contaminants in water, rather than bacterial loadings render uncertain the degree of pollution that treatment plants can remove. At this time there is no adequate basis for prescribing the limits of pollution that various processes can remove. Waste treatment plants do not always operate at peak efficiency and plant bypasses are used causing intensified pollution. The design of water treatment plants must allow for these items. As a rule the cost of treatment is a small part of the total cost of service. Customers are willing to pay the price to obtain a high-quality product. With the variety of measures available to the designing engineer and to the operator, it would be either futile or presumptuous to try to specify raw-water standards suitable for each combination of processes. (Bean-AWWARF)
W73-03491

WATER COMPOSITION AND CARDIOVASCULAR HEALTH.
Illinois State Medical Society, Chicago, Ill. Educational and Scientific Foundation.

Journal of the American Water Works Association, Vol 56, No 4, p 369-377, April 1964. 1 fig, 1 tab, 13 ref.

Descriptors: *Water treatment, *Water quality, *Public health, *Diseases, *Dissolved solids.
Identifiers: *Cardiovascular disease.

A special panel of six scientists concluded on the basis of available data that no causal relationship has been established between the total dissolved inorganic constituents of drinking water and cardiovascular disease. The minor constituents of food, water and the air are capable of influencing human physiology most profoundly. Well-known examples include the effect of iron in anemia, iodine in goiter, and fluorine in dental decay. The concentration of inorganic constituents is much greater in foods than in water, but the sum total of the constituents makes all sources important. Further work on the potential role of inorganic constituents of water on cardiovascular disease if undertaken, should involve the study of comparable populations in which the water supply with respect to one or more given constituents is controlled. Uniform criteria for diagnosis must be established, and the study must be continued over a period of years in order
W73-03492

ZETA POTENTIAL MEASUREMENTS IN THE CONTROL OF COAGULATION CHEMICAL DOSES,
Philadelphia Water Dept., Pa.
E. L. Bean, S. J. Campbell, and F. R. Anspach.
Journal of the American Water Works Association, Vol 56, No 2, p 214-227, February 1964. 8 fig, 3 tab, 8 ref.

Descriptors: *Water treatment, *Electrophoresis, *Zeta potential, *Electrolytes, *Coagulation, Control, Color, Turbidity, Taste, Odor, Activated Carbon, *Pennsylvania, *Delaware River.
Identifiers: Ferric sulfate, Aluminum sulfate, *Philadelphia.

Extended study of zeta potential (ZP) in the coagulation of Delaware River water at the Torresdale plant of Philadelphia showed that: (1) Color removal by coagulation with alum required neutral ZP. (2) Turbidity removal required somewhat negative ZP. (3) Color removal by coagulation with ferric sulfate was best with slightly positive ZP. (4) Taste and odor removal depended on the degree of removal of organic colloids that was accomplished in conjunction with either color or turbidity removal. Perhaps the major unsolved problem is the prevention of strongly charged stray particles remaining unneutralized and passing through the treatment processes. Their numbers and sizes are too small to produce turbidity detectable by currently used turbidimeters, but their presence is undesirable. Development of a method for automatically measuring ZP could open the way for automatic control of coagulant application. (Bean-AWWARF)
W73-03493

STUDIES OF MODIFICATIONS IN WATER FILTRATION,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
G. G. Robeck, K. A. Dostal, and R. L. Woodward.
Journal of the American Water Works Association, Vol 56, No 2, p 198-213, February 1964. 11 fig, 7 tab, 8 ref.

Descriptors: *Water treatment, *Water quality, *Filtration, Coliforms, Turbidity, Virusies, Organic matter, Activated carbon, Coagulation Sedimentation, Filters.
Identifiers: *Dual media filters, Carbon filters.

Pilot plant studies over a 1.5 year period using generally turbid water of the Little Miami River resulted in conclusions: (1) A double-layer bed of coarse media (18 in. of coal, effective size 1.05) on top of 6 in. of sand, was able to remove as much, or more, than coal or sand alone, of turbidity, coliform bacteria, poliovirus, or powdered carbon, and permitted extension of filter runs. (2) With proper coagulation ahead of the filter, 6 gpm/sq. ft. filtration rate was as effective in removing all test particles as a 4 or 2 gpm/sq. ft. rate. (3) Adequate floc strength was more important in achieving clarity than a certain settleability. (4) When the water was relatively clear (less than 25 units), the flocculation and sedimentation steps could be omitted if coarse media were in use on top of the sand. (5) Inclusion of flocculation and sedimentation permitted longer filter runs and better effluent quality during winter and flood conditions. (6) Poliovirus in clear water was more readily removed by beds of fresh, clean granular, activated carbon than by sand. (Bean-AWWARF)
W73-03494

REEVALUATION OF GRANULAR-CARBON FILTERS FOR TASTE AND ODOR CONTROL,
M. E. Flentje, and D. G. Hager.
Journal of the American Water Works Association, Vol 56, No 2, p 191-197, February 1964. 1 fig, 5 tab, 7 ref.

Descriptors: *Water treatment, *Water quality, *Filters, *Activated carbon, *Taste, *Odor, Flow rates, *Virginia, Filtration.
Identifiers: Carbon filters, *Hopewell (Virginia).

Taste and odor causing compounds are removed by adsorption on activated carbon. Granular activated carbon filters have a place in present day water treatment, especially where acceptable and where the demand is for highest quality. The possibility for economical reactivation has cancelled the reason for former rejection of such use. Use in average water plants would require additional filter units and low-head pumping of sand-filtered water to the carbon filters, as is done at Hopewell, Virginia. Operation may be either up-flow or down-flow. Beds are usually 9-10 ft. in depth. Flow rates of 5-10 gpm/sq. ft. are used. Granular activated carbon has definite advantages - cleanliness, ease of operation, self-adjustment to changing loads, and ability to produce odor-free water consistently. (Bean-AWWARF)
W73-03495

STATUS OF FLUORIDATION IN THE UNITED STATES AND CANADA, 1962.
American Water Works Association, New York. Task Group 2620P.

Journal of the American Water Works Association, Vol 56, No 1, p 111-120, January 1964. 3 fig, 10 tab, 3 ref.

Descriptors: *Water treatment, *Fluoridation, *Public health, Fluorides, Sodium compounds, Maryland, District of Columbia, *United States, *Canada, Puerto Rico.

In 1962, 105 water supplies in the U. S. and 33 in Canada instituted floridation. Total population served fluoridated water has reached 44 million in the U.S. and 2 million in Canada. 85.6 percent of the population of Puerto Rico now use fluoridated water. In the District of Columbia 100 percent use fluoridated water because the District Commission serves fluoridated water throughout the area. Maryland still leads the states in percentage of population receiving fluoridated water. Statement of policy regarding fluoridation of the American Water Works Association was reaffirmed by the Board on June 17, 1962. (Bean-AWWARF)
W73-03496

ELECTROPHORETIC STUDIES OF TURBIDITY REMOVAL WITH FERRIC SULFATE,
Florida Univ., Gainesville. Dept. of Chemistry.
A. P. Black, and J. V. Walters.
Journal of the American Water Works Association, Vol 56, No 1, p 99-110, January 1964. 5 fig, 2 tab, 20 ref.

Descriptors: *Water treatment, *Electrophoresis, *Turbidity, *Colloids, *Coagulation, Zeta potential, Hydrogen ion concentration, Color, Iron, Clays.
Identifiers: *Ferric sulfate, Aluminum sulfate.

Relationships were determined between electrophoretic mobility and other measurable variables involved in the removal of turbidity by ferric sulfate. Charge reversal at low pH was observed with three clay suspensions, when the ratio of coagulant dose to base exchange capacity was more than 3. As pH increased the mobilities decreased until the iso-electric point was reached in the pH range of 5 to 7. Such behavior was previously reported for the coagulation of colored water with ferric sulfate. In each clay suspension, at all ferric sulfate doses, in the pH zone of good coagulation the residual-iron values were less than allowed by Drinking Water Standards. Moreover, even at low pH the residual-iron values were lower by factors of 6 to 10 than those previously reported for coagulation of colored water with comparable doses of ferric sulfate. Two factors probably involved in this difference are base exchange capacity and the ability of organic matter of color to complex with ferric iron. The conclusion of greatest importance is that the microelectrophoretic technique may be useful for the prediction of the pH zone of most effective coagulation of natural waters. (Bean-AWWARF)
W73-03497

EFFECT ON FILTRATION OF POLYELECTROLYTE COATINGS OF DIATOMITE FILTER MEDIA,
Iowa State Univ., Ames.
C. S. Oulman, D. E. Burns, and E. R. Baumann.
Journal of the American Water Works Association, Vol 46, No 9, p 1233-1238, September 1964. 3 fig, 1 tab, 4 ref.

Descriptors: *Water treatment, *Electrolytes, *Diatomaceous earth, *Filtration, Coliforms, Zeta potential, Filters.
Identifiers: *Streaming potential, Filter media, *Diatomite filters.

Some synthetic organic polyelectrolytes will impart an electropositive coating to diatomite that is superior to that imparted by alum, and pressure losses during filtration are lower than with alum. Streaming potential measurements are useful for evaluating the completeness of the coatings produced by these electrolytes. Filter media coated with polyelectrolytes are potentially useful for water filtration in that they will provide more complete removal of turbidity, bacteria, and color colloids with a lower head loss than noncoated diatomite will. Recent research has shown that commercial grades of diatomite, designed to remove only 70-85 percent of the coliform organisms in water, will remove nearly 100 percent when the diatomite is coated with one type of polyelectrolyte. (Bean-AWWARF)
W73-03498

PROGRESS IN FILTRATION,
North Carolina Univ., Chapel Hill.
K. J. Ives.
Journal of the American Water Works Association, Vol 56, No 9, p 1225-1232, September 1964. 2 fig, 31 ref.

Descriptors: *Water treatment, *Filtration, *Filters, Flow rates.
Identifiers: Dual media filters, Indices, Sludge blanket.

The development of theories of filtration in the USA is traced from Eliassens' work at Providence, R.I., in 1935 to the present; also, developments in European countries which have been on somewhat different lines. Pre-war theories, recent formulations, recent experiments, new designs, upflow filters, biflow filters, multilayer filters, index of filtration, and sludge blanket clarifiers are described. (Bean-AWWARF)
W73-03499

SOME CHEMICAL ASPECTS OF RAPID SAND FILTRATION,
Georgia Inst. of Tech., Atlanta.
C. R. O'Melia, and D. K. Crapps.
Journal of the American Water Works Association, Vol 56, No 10, p 1326-1344, October 1964. 7 fig, 2 tab, 32 ref.

Descriptors: *Water treatment, *Filtration, *Electrolytes, Phosphates, *Zeta potential, Hydrogen ion concentration, *Coagulation.
Identifiers: Ferric coagulant, *Sand filtration.

Filtration within the pH range of 5-7 is affected much more significantly by the type of dissolved anion present than by the pH of the system. The surface properties of ferric floc particles markedly affect their filterability, and these properties depend on the chemical composition of the aqueous phase. These chemical effects are considered to result from interactions between the surfaces of the filter medium and the suspended floc particles; this conclusion lends strong support to adsorption as a predominant removal mechanism in rapid sand filters. In general, floc suspensions that exhibited Zeta Potentials ranging from low negative to high positive values produced rapid filter clogging rates and little bed penetratration. Adsorption can be impaired by elevating the pH, adding phosphate ions, and probably by other means yet to be evaluated. Adsorption can be improved through the proper use of electrolytes. (Bean-AWWARF)
W73-03500

INITIAL MIXING IN COAGULATION PROCESSES,
National Environmental Research Center, Cincinnati, Ohio.
R. J. Stenquist, and W. J. Kaufman.
Copy available from GPO Sup Doc as EP 1.23/2:72-053, $2.25; microfiche from NTIS as PB-213 902, $0.95. Environmental Protection Agency report EPA-R2-72-053, November 1972. 161 p, 40 fig, 4 tab, 69 ref, append. EPA Project 17030 DLX.

Descriptors: *Mixing, *Turbulence, *Coagulation, *Water treatment, Conductivity, Chlorination, Flocculation, *Waste water treatment.
Identifiers: *Initial mixing, Conductivity probes, *Kaolin suspension.

This investigation was undertaken with the objective of determining the importance of the initial mixing step in water and wastewater treatment processes and determining whether increasing the rapidity of the initial mixing could improve process performance. The principal process considered was alum coagulation-flocculation of a kaolin suspension in water. The initial mixing device under consideration was a biplane, square-mesh grid of bars placed in a turbulent flow, tubular reactor; a 2-in. pipe was used in the present studies. Studies were made using a single electrode 'point' conductivity probe and NaCl solution tracer to determine what parameters affect the mixing which occurs in the turbulent flow field downstream from a grid, and from these results a general mixing model was developed. The relation between initial mixing and process performance was studied by using two of the grids from the mixing studies as initial mixing devices in coagulation of a kaolin suspension. (EPA abstract)
W73-03511

APPARATUS FOR WATER PURIFICATION,
G. R. Whitten, Jr.
U. S. Patent No. 3,596,768, 5 p, 9 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 889, No 1, p 125, August 3, 1971.

Descriptors: *Patents, *Water purification, *Filtration, *Reservoirs, *Water supply, Chemicals, Equipment, Treatment, Abatement, Pollution abatement, Water quality, Water quality control, Water pollution, Water pollution control, *Water treatment.
Identifiers: *Chemical treatment.

A prefiltering levee such as a bank-run gravel or other suitable filtering material is constructed within a body of water to segregate a portion of a reservoir. In its passage through the levee, most of the heavy suspended particles are removed from the water. A second filtering pass is provided by installing a water purification unit. This unit includes a mixing chamber, a filtering chamber, skimming means for intaking surface water and an outlet for passing the filtered water directly back to the reservoir. Various purifying chemicals may be added to the processed water in its passage through the unit. (Sinha-OEIS)
W73-03624

INDUSTRIAL METERING,
Los Angeles Dept. of Water and Power, Calif.
For primary bibliographic entry see Field 08C.
W73-03635

ACTIVATED CARBON (ADSORPTION) TO REMOVE ORGANIC CONTAMINANTS FROM WATER,
Western Corp., Covington, Va. Carbon Technical Service Lab.
For primary bibliographic entry see Field 05D.
W73-03637

WATER SUPPLY FROM ESTUARIAL SOURCES,
Parsons Brinckerhoff-Hirota Associates, Honolulu, Hawaii; and New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 03A.
W73-03639

PUBLIC WATER SUPPLY MANUAL, A GUIDE FOR THE PREPARATION OF APPLICATIONS, REPORTS AND PLANS FOR PUBLIC WATER SUPPLY PERMITS.
Pennsylvania Dept. of Water Resources, Harrisburg. Bureau of Water Quality Management.

Publication Number 15, 2nd edition, November 1, 1971. 32 p.

Descriptors: *Water supply, *Regulations, *Water treatment, *Pennsylvania, Water quality standards, Permits, Drawings, Legal aspects, Water delivery, Waterworks, Water treatment plants, Water supply systems.

To provide for the regulation of public water supplies for the promotion and protection of the public health of the people of Pennsylvania, the Department of Environmental Resources has been empowered by law to implement this goal. This manual was prepared to assist local waterworks personnel, serving as a guide for water treatment. The design of local facilities should not be limited by minimum standards, but should be governed by the needs of the local situation. It is departmental policy to encourage progress in water supply treatment, but reliable engineering data must be provided before approval of such design will be granted. Experimental installations will be permitted with the understanding that the noncompliance with water quality standards will force the State to shut down such a facility. This guide has fifteen sections plus an appendix on feneral instructions. The fifteen sections include topics on: (1) permit applications, (2) water sources, (3) pretreatment, (4) softening, (5) filters, (6) iron and manganese removal, (7) taste and odor control, (8) fluoridation, (9) pumping stations and (10) distribution systems. All aspects of conventional water treatment are covered and rules and regulations for water treatment are described in detail. (Poertner)
W73-03647

GRANULAR-ACTIVATED-CARBON BEDS FOR ODOR REMOVAL,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
R. L. Woodward, K. A. Dostal, and G. G. Robeck.
Journal of the American Water Works Association, Vol 56, No 3, p 287-295, March 1964. 5 fig, 1 tab, 9 ref.

Descriptors: *Water treatment, *Filters, *Activated carbon, Design, Phenols, Ozone, Taste, *Odor, Filtration.
Identifiers: *Carbon filters.

Cincinnati tap water applied to four 4-inch diameter, 2 1/2 ft. deep, granular carbon filters, to study the removal of odorous compounds. In one filter 1 ppm of hydrogen peroxide was added and to another 1 ppm of ozone. During the first two months carbon-chloroform-extractable material in the applied water was 400 ppb; after that period it averaged 250 ppb. The hydrogen peroxide and ozone applications proved of no value. Adsorption

included the full depth of the carbon beds. The more odorous compounds were removed the best, and breakthrough of detectable odors did not occur for 5 months. Conclusion were: (1) more efficient use of carbon would be achieved by a longer contract time, either by use of a deeper bed or a lower rate, (2) use of finer mesh carbon would contribute to more complete utilization of the capacity of the carbon. Either of these alternates might increase costs, (3) there is as yet no rational procedure available for designing granular activated-carbon adsorption beds for maximum economy in water plant use. (Bean - AWWARF).
W73-03655

IRON REMOVAL USING FILTER AID FILTERS,
Johns-Manville Research and Engineering Center, Manville, N.J.
G. R. Bell.
Journal of New England Water Works Association, Vol 78, No 3, p 258-269, September 1964. 2 fig, 1 tab, 12 ref.

Descriptors: *Water treatment, *Iron, *Filters, *Filtration, *Groundwater, Pilot plants, Aeration, Oxidation, Magnesium compounds, Diatomaceous earth, Costs, *Massachusetts.
Identifiers: *Filter aid, Magnesium oxide.

Iron in groundwaters in Massachusetts is a frequent cause for their rejection as potential sources of supply, though from bacteriological and other standpoints they are preferred over many surface supplies. A project with several sponsors was initiated by the Massachusetts Department of Public Health at the Lawrence Experiment Station, utilizing a 60 gpm pilot plant which was moved three times to utilize other waters. At Amesbury aeration was too slow to be practical and chemical oxidation produced precipitates which were relatively unfilterable - they could be filtered but not economically. The pilot plant was changed to use diatomite filter aid and magnesium oxide (calcined magnesite) treatment, and established that iron can be removed from solution in filterable form by use of an appropriate alkali with diatomite filter aid followed by direct filtration without settling or sedimentation. These processes require little or no chemical control, and may be modified to fit particular raw or finished water requirements. Costs were competitive. (Bean - AWWARF)
W73-03656

ELECTROKINETIC PHENOMENA IN PARTICULATE REMOVAL BY RAPID SAND FILTRATION,
Tufts Univ., Medford, Mass.
C. V. Smith, Jr.
Journal of New England Water Works Association, Vol 81, No 2, p 170-212, June 1967. 16 fig, 4 tab, 16 ref.

Descriptors: *Water treatment, *Filtration, *Coagulation, *Flocculation, *Adsorption, Electrolytes, Iron compounds, Sodium compounds, Bentonite, Zeta potential, Pilot plants.
Identifiers: *Electrokinetics, *Streaming current, Particle removal.

A review is presented of the 1917 presentation by Ellms on water purification, 1964 publications by Oulman and Boumann on streaming potentials in diatomite filtration, Oulman on polyelectrolyte coatings of diatomite filter media, Camp on theory of filtration, and O'Melia and Crapps on chemical aspects of rapid sand filtration, concluding that adsorption is the predominant removal mechanism. The primary purpose of this investigation was to determine what role the filter medium surface electrokinetic potential plays in removing particulate matter from water. To be more specific, does the zeta potential of the filter medium itself have any significant effect upon particulate removal. The second purpose was to determine whether the mechanism of filtration was a function of the type of particulate material filtered. Pilot plant studies utilized Baltimore City tap water, with average hardness about 66 and total dissolved solids of 98, with a completely automatic, continuous flow system. Bentonite clay was utilized to furnish particles and a Coulter-Counter was used to count particles in the effluent. It was concluded that, (a) The mechanism for the removal of bentonite clay particles is primarily electrostatic in nature; consequently, the electrokinetic potential of the filter medium is involved, (b) The mechanism for removal of iron floc is flocculation and coagulation within the filter grain interstices, (c) Iron floc penetration can be increase without any effluent quality deterioration by a decrease in either the iron to bentonite clay ratio or the iron to hexametaphosphate ratio. (Bean - AWWARF)
W73-03657

STUDY OF COLOR AND IRON REMOVAL BY MEANS OF PILOT PLANT AT AMESBURY,
Massachusetts Dept. of Public Health, Boston.
R. A. McCracken.
Journal of New England Water Works Association, Vol 75, No 2, p 102-114, June 1961. 3 ref.

Descriptors: *Water treatment, Water quality, *Color, *Iron, *Manganese, *Groundwater, *Surface water, *Pilot plants, Aluminum, Flocculation, Sedimentation, Filtration, Stability, Flow rates, Chlorination, Calcium compounds, Hydrogen ion concentration, *Massachusetts.
Identifiers: *Jar tests, *Amesbury (Mass).

Laboratory jar tests and a pilot plant were utilized in search of a suitable treatment for iron and color removal from the Amesbury water. With alum as coagulant, the pilot plant did not accomplish as acceptable a degree of iron removal on the well water as had been indicated by jar tests. With chlorine as an oxidizing agent and lime for pH control, a treated well water with iron content below 0.05 ppm, no manganese and color on the order of 5 ppm was produced after flocculation, sedimentation and filtration. The proposed treatment with 9 ppm chlorine and 22 ppm lime produced water with a pH quite close to the pH indicated for corrosion control. For color removal from water of the Powow River alum appeared to be a better coagulant than the iron salts. In actual plant operation, an increase in rate of flow would mean a decrease in flocculation and sedimentation time. However, the pilot studies indicated that if satisfactory floc was formed the filters could be operated at rates greatly in excess of 2 gpm/sq. ft. without a decrease in the quality of effluent. (Bean - AWWARF)
W73-03658

TASTE AND ODOR CONTROL FOR PALATABLE WATER.
Tufts Univ., Medford, Mass. Coll. of Engineering.
A. F. Evans.
Journal of New England Water Works Association, Vol 75, No 2, p 77-90, June 1961. 1 fig, 46 ref.

Descriptors: *Water treatment, Water quality, *Taste, *Odor, *Mineral water, *Algae, *Actinomycetes, Industrial wastes, Sewage, Aeration, Potassium compounds, Copper sulfate, Chlorination, Activated carbon, Ozonation, *Potable water.
Identifiers: Permanganate, Chlorine dioxide, *Organic decomposition.

Water with an odor will always have a taste - because odors affect the same nerves as tastes. However, not all waters having bad tastes will have bad odors. Dissolved minerals will give taste but no odor. Measuring and classification systems are discussed. Six agents causing tastes and odors are listed as (1) algae and actinomycetes, (2) putrefaction, (3) industrial wastes and sewage, (4) dissolved minerals, (5) applied treatment, and (6) piping. Methods of avoiding or removing the tastes and odors are discussed, including use of aeration, potassium permanganate, copper sulfate, superchlorination, activated carbon, chlorine dioxide and ozonation. An overall picture of taste and odor control is presented and some of the problems are described. Industrialization will create new products and materials and, thus, new problems. (Bean - AWWARF)
W73-03659

REMOVAL OF IRON AND MANGANESE FROM GROUND WATERS,
Weston and Sampson, Boston, Mass.
G. G. Bogren.
Journal of New England Water Works Association, Vol 76, No 1, p 70-76, March 1962. 2 ref.

Descriptors: *Water treatment, *Water quality, *Iron, *Manganese, *Groundwater, Aeration, Coagulation, Filtration diatomaceous earth, Oxidation, Hydrolysis, Chlorination, Potassium compounds, Ion exchange.
Identifiers: Permanganate, Contact beds, Alkalinization.

Problems caused by iron and manganese, their prevalence in ground waters, and the mechanism by which they are placed in solution in the ground waters are discussed. Common methods of rendering the iron insoluble (ferric state) and thus removable are discussed, including oxidation, alkalinization and hydrolysis. Oxidation by aeration, contact beds, chlorination and potassium permanganate are discussed. Removal by ion-exchange processes in smaller supplies is noted. Coagulation and filtration, removing organic matter with the associated iron; oxidizing the iron to utilize its coagulating capacity in conjunction with supplemental coagulant dosing; spray aeration and contact aeration on coke beds; and use of diatomite filters for iron removal after oxidation are discussed. Development of inexpensive and dependable plants for removal of iron and maganese from ground waters creates a source of water supply for small to medium-sized communities that is much less expensive than desalinization of brackish and sea waters. (Bean - AWWARF)
W73-03660

THE ROLES OF CHLORINATION AND FILTRATION IN THE TREATMENT OF SURFACE WATER SUPPLIES,
Weston and Sampson, Boston, Mass.
R. M. Pope.
Journal of New England Water Works Association, Vol 81, No 3, p 258-272, Sept. 1967. 10 ref.

Descriptors: *Water treatment, *Water quality, *Chlorination, *Filtration, Surface waters, *Disinfection, Coliforms, Viruses, Taste, Odor.
Identifiers: Amoebic bacteria, Cysts.

Chlorination and filtration are vital to the dependable production of safe water from surface supplies. The parts they play have changed with time and vary depending on the conditions. Chlorination was adopted in the early 20's for the disinfection of water. In more recent times chlorine has, in addition, been used to combat color, tastes and odors, pipe line and plant deposits and slimes, and under some conditions to aid coagulation. The many factors affecting the change of roles are discussed. Notice should be taken of these items in New England, where the reasons for complete treatment exist but are not as obvious as in other parts of the country. Rapid sand filtration plants should be designed and operated with the intent to maintain reasonably high efficiencies of bacterial removal before postchlorination. The postchlorination should be considered an additional safety factor. A filter effluent that has less than ideal coliform content is likely to have less than ideal taste, odor or color characteristics be-

fore and after postchlorination. Ordinary chlorination cannot be depended upon to kill amoebic cysts, viruses, or even in some cases coliform. (Beam - AWWARF)
W73-03661

COAGULATION AND FLOCCULATION OF SURFACE WATERS,
Hazen and Sawyer, New York.
H. E. Hudson, Jr.
Journal of New England Water Works Association, Vol 80, No 3, p 232-257, September 1966. 8 fig, 1 tab, 8 ref.

Descriptors: *Water treatment, *Water quality, *Coagulation, *Flocculation, *Design, *Filters, Filtration, Mixing, Sedimentation, Surface waters.

Physical and engineering considerations involving coagulation and flocculation, as they effect the design of mixing, flocculating, settling and filtering facilities in water treatment plants are discussed. In the clarification of water by coagulation, flocculation, sedimentation and filtration, it is important to attain thorough dispersion of the coagulant into the water in order to obtain good coagulation. Thereafter, protracted agitation to attain flocculation is needed. Flocculation may be seriously impaired by the provision of insufficient detention time, by insufficient agitation, or by short-circuiting in the flocculation chamber. The effects of these deficiencies are shown by poor settled water quality, and by poor filtered water quality, using a variety of parameters. (Bean - AWWARF)
W73-03662

EXPERIENCES WITH DIATOMITE FILTRATION,
De Laval Turbine, Inc., New York.
J. S. Brown.
Journal of New England Water Works Association, Vol 81, No 3, p 294-300, Sept. 1967.

Descriptors: *Water treatment, *Filtration, *Diatomaceous earth, Turbidity, Color, Bacteria, Algae, Iron, Manganese, Taste, Odor, Iron compounds, Calcium compounds, Hydrogen sulfide.
Identifiers: Permanganate, Magnesite, Ferric sulfate.

Principles of operation of the diatomite filter, its limitations, applications and some results of operation are discussed. Turbidity over 25 probably will not favor diatomite, from 10 to 25 may favor it, while under 10 will favor diatomite. Color removal is generally limited to the apparent color, the true color remaining in the effluent. Bacterial removal, with the right conditions, may run to essentially 100 percent removal. Algae may be removed without killing and thereby producing taste and odor. Installations utilizing ferric coagulants and calcium carbonate, also ferric sulfate and magnesium oxide for color and iron removal are described. Four installations in Massachusetts perform iron removal using calcined magnesium oxide, followed by diatomite filtration. The magnesite will only work to a slight degree on soluble manganese. Potassium permanganate will precipitate the manganese and produce a manganese-free effluent. Hydrogen sulfide may be removed by preinjection of chlorine at approximately 4 to 1 ratio, which reduces it to particulate sulfur which is easily removed on the filter cake. An installation in California removes algae by the diatomite followed by tastes and odors removal on granular carbon beds. (Bean - AWWARF)
W73-03663

A NEW METHOD OF COLOR REMOVAL: DEVELOPMENT REPORT,
Diamond Shamrock Chemical Co., Redwood City, Calif.
D. A. Jayes, and I. M. Abrams.
Journal of New England Water Works Association, Vol 82, No 1, p 15-25, March 1968. 2 fig, 3 tab, 4 ref.

Descriptors: *Water treatment, *Resins, *Diatomaceous earth, *Color, Coliforms, Sodium compounds, Flow rates, Pilot plants, Hydrogen ion concentration, Costs.
Identifiers: *Merrimack River.

Two years of pilot plant work on Merrimack River water has demonstrated the feasibility of color removal with Duolite A-7, a porous, synthetic resinous absorbent. Of the various regenerants tested, caustic soda at 4 lbs/cu ft. both effective and economical. Flow rate of 1 gpm/cu ft. was near optimum; however, doubling the flow rate increased color leakage by only 5 APHA units. The necessity for pre-treatment was demonstrated; diatomaceous earth filtration was effective. There was significant removal of iron (presumed to be dissolved), increase in pH and reduction in color and coliform bacteria by the Duolite A-7. An economic evaluation determined materials cost at 3 to 4 cents per thousand gallons. (Bean - AWWARF)
W73-03664

RECENT DEVELOPMENT IN THE USE OF IODINE FOR WATER DISINFECTION,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
P. C. Karalekas, Jr., L. N. Kuzminski, and T. H. Feng.
Journal of New England Water Works Association, Vol 84, No 2, p 152-188, June 1970. 12 fig, 3 tab, 32 ref.

Descriptors: *Water treatment, Public health, *Disinfection, *Bactericides, *Iodine, *Microorganisms, *Hydrogen ion concentration.

Some of the important properties of iodine in relation to its potential as a water disinfecting agent are disucssed. Information is presented on the death kinetics of bacteria on exposure to iodine. Death kinetics of six public health significant microbial genera were determined on exposure to an initial free iodine concentration of 1.0 ppm in distilled water. The temperature at which these were ascertained was 3 - 4C and the pH values used for the exposure substrate were 5.0, 7.0, and 0.0. The six genera tested were streptococcus faecalis, salmonella senftenberg, pseudomonas aeruginosa, escherichia coli, staphylococcus aureus, and aerobacter aerogenes. Only slight differences were generally observed between bacterial resistance at pH 5.0 and 7.0. At pH 9.0 a marked reduction in the microbicidal efficacy of iodine was notes, with perhaps one exception. Possible reasons for this decreased efficiency are discussed. Of the six microorganisms, streptococcus faecalis was the most resistant to iodine at all pH levels. (Bean - AWWARF)
W73-03665

HOW'S YOUR VIRUS IQ,
Environmental Protection Agency, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
H. Berg.
Water and Wastes Engineering, Vol 8, No 10, p 35, 36, and 40, Oct 1971.

Descriptors: *Water treatment, *Water quality, *Public health, *Viruses, Disinfection, Sedimentation, Coagulation, Filtration, Activated carbon, Water softening, Chlorine, Iodine, Bromine, Ultraviolet radiation, Gamma radiation.

A human can be infected by a single viable virus excreted by another human. Small amounts of viruses entering rivers and streams with wastewaters are hazardous to those downstream who use these waters. Detection capability must be developed for one virus in 100 gal of water. Investigation of the problems of viruses in water is in its infancy. Various analytical techniques are discussed. Various treatment processes are cited, and efficiencies shown by published studies are indicated, including primary settling 40 to 70 percent in 24 hours, coagulation with alum or ferric chloride 90 to 97 percent, excess lime coagulation and polyelectrolytes with common coagulants, 99 to 99.9 percent.The degree of adsorption to activated carbon and sand is not clear. Effectiveness of chlorine residuals in killing viruses is discussed, the free residual, or hypochlorous acid, is required. Ozone, iodine, bromine, ultra-violet radiation and gamma irradiation are under study. (Bean - AWWARF)
W73-03666

THE FEDERAL WATER REPORT AND ITS IMPACT ON VERMONT'S PUBLIC WATER SUPPLIES,
Vermont State Dept. of Health, Montpelier. Div of Environmental Health.
H. E. Sargent.
Journal of the New England Water Works Association, Vol 85, No 2, p 160-167, June 1971.

Descriptors: *Water treatment, *Water quality, Water pollution, Public health, *Vermont, *Water supply.

Under the U.S. Public Health Service Community Water Supply Study in 1969, visits were made to 214 systems serving 281,700 consumers, 64 percent of Vermont's population. The study was requested by the State's Health Commissioner, because it was known that the states' overall drinking water quality was declining. The contents of the report were not surprising to the staff of the Department. It serves to help convince others of the need for emphasis on water supply surveillance and improvements. The most significant deficiency was the lack of sufficient surveillance, sample monitoring and cross-connection control. Surveillance is a dual responsibility of state and local officials. State support is needed to help the water system manager convince officials that improvements are needed. Inadequate staffing of the State Department and resulting inattention, coupled with a general unawareness of potential disease by many system managers, have left many supplies vulnerable to this type of public health danger. One hundred five supplies are from springs in locations from isolated mountain areas to the center of villages. Only 23 of these supplies are disinfected. Sixteen surface supplies provide untreated and unchlorinated water. Nine surface supplies are used for water-contact sports. All but one receive chlorination, that one has been under orders to boil water for more than a year. Additional monies should be appropriated at the federal and state levels for grants and personnel. (Bean - AWWARK)
W73-03667

BALANCING NEEDS, RESPONSIBILITY, AND COSTS IN THE DISTRIBUTION SYSTEM--DISTRIBUTION STORAGE,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 05G.
W73-03671

CONTROL OF THE INFECTIOUS PROTOZOAN CERATOMYXA SHASTA BY TREATING HATCHERY WATER SUPPLIES,
Oregon State Univ., Corvallis. Dept. of Microbiology.
J. E. Sanders, J. L. Fryer, D. A. Leith, and K. D. Moore.
Prog Fish-Cult. Vol 34, No 1, p 13-17. 1972.
Identifiers: *Fish hatcheries, *Pest control, Fish parasites, Ceratomyxa shasta, Control, Irradiation, Oncorhynchus kisutch, Protozoa, Salmo gairdneri, Ultra violet irradiation, Water treatment.

Selected water treatment systems were tested to determine if they would remove or destroy the infective stage of C. shasta in fish hatchery water supplies. Reduction in the number of mortalities occurred in juvenile rainbow (steelhead) trout (Salmon gairdneri) exposed to Deschutes River water treated by MicroFLOC filtration, MicroFLOC filtration and chlorination, and UV irradiation. The effectiveness of UV irradiation can probably be attributed to the very low turbidity levels of Deschutes River water. High rate sand filtration of Columbia River water had no detectable effect on the number of C. shasta infections in juvenile coho salmon (Oncorhynchus kisutch); however, high-rate sand filtration plus UV irradiation greatly reduced the incidence of this disease. Exposure times necessary for contracting C. shasta were investigated by holding juvenile coho salmon in untreated Columbia River water at different intervals. These experiments suggest that infections caused by this parasite may occur during 30 min exposure to untreated Columbia River water. These observations indicate the necessity for continuous treatment of the incoming water supply.--Copyright 1972, Biological Abstracts, Inc.
W73-03705

PREVALENCE OF DENTAL CARIES, ENAMEL OPACITIES AND ENAMEL HYPOPLASIA IN UGANDIANS,
Aarhus Tandlaegehojskole (Denmark).
I. J. Moller, J. J. Pindborg, and B. Roed-Petersen.
Arch Oral Biol. Vol 17, No 1, p 9-22. 1972. Illus.

Descriptors: *Public health, Dental caries, Enamel, *Fluoride, Hypoplasia, Opacities, Prevalence, Uganda.

An epidemiological survey on the prevalence of dental caries, enamel opacities and enamel hypoplasia was conducted on 1399 persons in 4 districts in Uganda with fluoride in the drinking water varying from 0.11-3.00 ppm. The dental caries experience was very low (0.0-0.9 DMF-T/person in the 5-9 yr age group and 0.4-2.8 DMF-T/person in the age group>40 yr). The expected inverse relationship between the prevalence of dental caries and the fluoride content of the drinking water was demonstrated. The optimum fluoride concentration in the drinking water in Uganda was calculated to be approximately 0.6 ppm F. The dental caries experience was higher in Asians than in Africans and higher in the primary than in the permanent dentition. The prevalence of nonfluoride enamel opacities and hypoplasia was lower in high-fluoride areas in comparison with low-fluoride areas. The importance of the immediate introduction of preventive measures is stressed.--Copyright 1972, Biological Abstracts, Inc.
W73-03804

THE CHEMICAL POLLUTION OF DRINKING WATER,
Liverpool Univ. (England).
C. D. Reed, and J. A. Tolley.
Prot Vitae, Vol 16, No 4, p 169-170, 1971.
Identifiers: *Chemical wastes, Contamination, Recycling, Disease, Public health, Potable water, *Water pollution.

Sampling on a statistical basis was undertaken and the results plotted with disease incidence figures on maps. The method of sampling is discussed. Attention is drawn to the concentrating action of recycling on the toxins in drinking water, and the suggestion made that large undertakings seek their own supplies from the sea instead of using public sources. The indirect contamination of man by the residues left on pots, cutlery and clothing is mentioned and attention drawn to the use of drinking water analyses as an indicator of plant contamination.--Copyright 1972, Biological Abstracts, Inc.
W73-03815

SORPTION METHODS OF TOXINS REMOVAL FROM DRINKING WATER (IN RUSSIAN),
Meditsinskii Institut, Saratov (USSR).
E. V. Shtannikov, and A. A. Shindryaev.
Gig Sanit, Vol 36, No 10, p 18-21, 1971, Illus, English summary.
Identifiers: *Water purification, Potable water, Coagulants, Flocculants, Methods, Minerals, Sorption, *Toxins.

A hygienic assessment was made of the removal of toxic substances from H2O using sorption agents. Mineral coagulants (Al2 (SO4)3 and Fe2 (SO4)3) with and without simultaneous alkalinization of water and their joint use with flocculants (polyacrilamide and BA-2) were highly effective.--Copyright 1972, Biological Abstracts, Inc.
W73-03816

STUDY OF OZONE TREATMENT OF THE DNIEPER WATER (IN RUSSIAN),
For primary bibliographic entry see Field 05G.
W73-03817

EXPERIMENTAL SUBSTANTIATION OF PERMISSIBLE RESIDUAL CONCENTRATION OF POTASSIUM PERMANGANATE IN DRINKING WATER (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR). Dept. of Public Hygiene.
S. A. Shigan, and B. R. Vitvitskaya.
Gig Sanit, Vol 36, No 9, p 15-18, 1971, Illus, English summary.
Identifiers: *Public health, Potable water, Concentration, Mice, *Potassium Permanganate, Rats, Residuals.

The threshold limit concentration of Mn was 2 mg/l in rats and mice. Taking into account its deteriorating action on clothing the permissible residual concentration in H2O should be within 0.1 mg/l.--Copyright 1972, Biological Abstracts, Inc.
W73-03818

IDENTIFICATION AND REMOVAL OF SUBSTANCES IMPARTING AN ODOR AND AFFECTING THE TASTE OF RIVER BANK FILTERED GROUND WATER,
Thielemann (H.), Halberstadt (East Germany).
For primary bibliographic entry see Field 05A.
W73-03819

5G. Water Quality Control

FLUSHING OF SMALL SHALLOW LAKES,
Washington State Univ., Pullman. R. L. Albrook, Hydraulic Lab.
For primary bibliographic entry see Field 05C.
W73-03252

WATER QUALITY MANAGEMENT DECISIONS IN COLORADO,
Colorado State Univ., Fort Collins. Environmental Resources Center.
S. R. Nichols, G. V. Skogerboe, and R. C. Ward.
Available from the National Technical Information Service as PB-213 812, $3.00 in paper copy, $0.95 in microfiche. Completion Report AER71-72SRN-GVS-RCW8, Completion Report Series No 38, 1972. 93 p, 6 fig, 3 tab, 75 ref. OWRR A-010-Colo (2).

Descriptors: Administration, *Administrative agencies, Institutions, Law enforcement, Regulation, Water pollution, *Water pollution control, Water quality, *Water quality control, *Colorado.
Identifiers: *South Platte River basin.

An evaluation of Colorado's present water quality monitoring system has been made, as well as the capability of present institutional programs to anticipate potential pollution problems, and recommendations have been made for alternative pollution enforcement methods. Both Federal and State legislative history pertinent to Colorado water pollution problems have been delineated. Primary emphasis has been given to the South Platte River Basin, because it represents the most severe combination of municipal, industrial, and agricultural pollution problems in Colorado. (Skogerboe - Colorado State)
W73-03261

LEGAL ASPECTS OF WATER POLLUTION IN NEW JERSEY AND PENNSYLVANIA: A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.

Available from the National Technical Information Service as PB-213 853, $3.00 in paper copy, $0.95 in microfiche. Water Resources Scientific Information Center, WRSIC 72-217, November 1972. 227 p.

Descriptors: *Pennsylvania, *New Jersey, *Water Pollution Control, *Information retrieval, *Bibliographies, Abstracts, Water quality control, Pollution abatement, Water pollution, Interstate compacts, Interstate commissions, Legislation, Sewage disposal, Regulation, Standards, Water supply, Water pollution sources, Administrative agencies, Industrial wastes, Water pollution effects, Permits, Public health, Treatment, Facilities, Delaware River Basin Commission.

This bibliography contains abstracts from Selected Water Resources Abstracts through October 1, 1972, (Volume 5, Number 19) dealing with legal aspects of water pollution in New Jersey and Pennsylvania. A significant descriptor index representing weighted terms that best describe the information content of the article, a comprehensive index representing all of the descriptors and identifiers by which each paper has been indexed, and instructions for using the indexes and obtaining copies of documents listed are included. (Brackins-Florida)
W73-03276

SIMULATION OF WATER QUALITY ENHANCEMENT IN A POLLUTED LAKE, A CASE STUDY OF VANCOUVER LAKE, WASHINGTON,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 05C.
W73-03310

SCHWENGEL--A SOIL CONSERVATION LEADER,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03312

LAKE TAHOE AND FRAGILE ENVIRONMENT,
House, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03313

CONFERENCE REPORT ON H.R. 9727, RESTRICTION ON DUMPING OF MATERIAL IN OCEANS, COASTAL AND OTHER WATERS.
For primary bibliographic entry see Field 06E.
W73-03316

CONFERENCE REPORT ON S.2770, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENT OF 1972.
For primary bibliographic entry see Field 06E.
W73-03317

PACIFIC NORTHWEST RIVER BASINS COMMISSION, ANNUAL REPORT, FISCAL 1971.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03318

STANDING TO BRING ENVIRONMENTAL ACTIONS: QUI TAM AND THE REFUSE ACT OF 1899,
J. W. Zirkle.
Tennessee Law Review, Vol 39, p 459-478, 1972. 132 ref.

Descriptors: *Rivers and Appropriations Act, *Judicial decisions, *Water law, *Watercourses (Legal aspects), *Legislation, Legal aspects, Water pollution control, Law enforcement, Penalties (Legal), Legal review, Administrative decisions, Administrative agencies, Decision making, Federal Water Pollution Control Act.
Identifiers: *Standing (Legal), *Refuse Act, *Qui tam actions, Citizen suits.

Although the federal courts seem to be relaxing the standing requirements, they have consistently rejected qui tam actions under the Refuse Act of 1899 because of lack of standing by private citizens. Federal court decisions on standing for environmental suits through the Supreme Court decision in Sierra Club v. Morton are described. The many decisions granting standing to conservationist groups are distinguishable from the qui tam cases because such actions were brought by people aggrieved by agency action; the qui tam cases present instances where no agency has acted. The Refuse Act as well as its judicial history are discussed. Although potentially effective legislation, the Act has largely been ignored by the Justice Department. For this reason the qui tam action has become significant. The qui tam action is defined, traced historically and discussed in relationship to the Refuse Act. Every suit brought on a qui tam action based on the Refuse Act has been dismissed. The language of the Act is explicit; it specifies that all actions to enforce the Act be initiated by the Justice Department. Therefore the decisions of the courts to deny standing to bring qui tam actions are correct. (Brackins-Florida)
W73-03322

CURRENT EMISSION STANDARDS, REFINING, AND THE PETROLEUM INDUSTRY,
P. E. Bermingham.
Loyola of Los Angeles Law Review, Vol 5, p 253-279, 1972. 173 ref.

Descriptors: *Oil pollution, *Waste disposal, *Legislation, *Water pollution control, Water law, Legal aspects, Watercourses (Legal aspects), Federal Water Pollution Control Act, Rivers and Harbors Act, Water pollution sources, Pollution abatement, Industrial wastes, State governments, Federal government, Navigable waters, Oil spills, Oil industry, Oil wastes, Water quality control, Water quality standards, Thermal pollution.
Identifiers: Refuse Act, Citizen suits, Standing (Legal).

Investigation of effluent discharge by refineries into neighboring waterways was the first area involving pollution by the petroleum industry into which the federal government immersed itself. Federal water pollution legislation, instead of reposing complete authority in either the states or the national government, provides for a partnership arrangement. Oil spills and discharges of designated hazardous polluting substances other than oil are areas wherein the federal government has intervened directly without first, as in the case of water quality standards, providing the states an opportunity to act. However several states do have laws of their own dealing with such discharges. The 1970 Federal Water Pollution Control Act is discussed in relationship to oil pollution as well as the Refuse Act and the interaction of the two laws. Also discussed is the definition of the concept of navigable waters. The problem of thermal pollution and measures taken by the Environmental Protection Agency are also described. The efficient enforcement of pollution laws is, and will remain, a direct function of money, manpower, and competing social interests. (Brackins-Florida)
W73-03327

AN OVERVIEW OF INTERNATIONAL ENVIRONMENTAL REGULATION,
Toledo Univ., Ohio. Coll. of Law.
For primary bibliographic entry see Field 06G.
W73-03330

TOWARD A WORLD ORDER RESPECTFUL OF THE GLOBAL ECOSYSTEM,
Princeton Univ., N.J. Center of International Studies.
For primary bibliographic entry see Field 06G.
W73-03331

THE RIVERS AND HARBORS ACT OF 1899--A NEW REMEDY FOR ILLEGAL DREDGE AND FILL OPERATIONS,
R. Brock.
University of Florida Law Review, Vol 24, p 795-801, 1972. 64 ref.

Descriptors: *Rivers and Harbors Act, *Dredging, *Judicial decisions, *Remedies, Legal aspects, Water law, Legislation, Environmental effects, Florida, Water quality control, Watercourses (Legal aspects), Permits, Navigation, Navigable waters, Excavation, Administrative agencies, Penalties (Legal), Damages.
Identifiers: Injunctions (Prohibitory), Fish and Wildlife Coordination Act, National Environmental Policy Act.

In United States v. Moretti, the United States District Court for the Southern District of Florida held that defendants had unlawfully conducted dredge and fill operations. The court ordered the defendants to restore the area in which they were dredging and filling to its original condition. Although the Rivers and Harbors Act places no restrictions on the Secretary of the Army's discretion to deny or grant a permit for a dredge and fill operation, most cases arising under the Act have dealt only with navigation problems. However, recent decisions have upheld the Secretary's authority to deny such a permit solely on environmental grounds. One basis of these decisions is the Fish and Wildlife Coordination Act, which requires any private or public agency seeking a federal permit to alter a navigable body of water to first consult the United States Fish and Wildlife Service. The National Environmental Policy Act is another such basis. The significance of the Moretti case lies in the remedy granted by the court, that is, ordering defendant to restore the area to its original condition. This decision indicates that violators of dredge and fill permit procedures are no longer risking only a token fine or a cease and desist order. (Brackins-Florida)
W73-03332

BD. OF COMM'RS. OF THE PORT OF NEW ORLEANS V. GYPSUM TRANSPORTATION, LTD. (HAZARDS TO NAVIGATION AND THE RIVERS AND HARBORS ACT OF 1899).
For primary bibliographic entry see Field 06E.
W73-03333

RURAL DEVELOPMENT ACT OF 1972--LEGISLATIVE HISTORY.
For primary bibliographic entry see Field 06E.
W73-03348

CHARLES V. DIAMOND (RESTRICTION ON DEVELOPMENT AFFECTING OVERLOADED SEWAGE SYSTEM).
For primary bibliographic entry see Field 06E.
W73-03355

MODEL STATUTE: INTERNATIONAL DRAINAGE BASIN POLLUTION CONTROL,
Denver Univ., Colo. Coll. of Law.
R. Israel, and R. Zupkus.
The Denver Journal of International Law and Policy, Vol 2, p 89-106, 1972. 40 ref.

Descriptors: *International commissions, *Water pollution control, *Waste treatment, *Administrative agencies, Adjudication procedure, River basin commissions, Watershed management, River basin development, River basins, Watersheds (Basins), Legislation, Legal review, Costs, Pollution abatement, Water pollution sources, Water utilization, Industrial wastes, Governments, Waste disposal, Penalties (Legal), Watercourses (Legal aspects), Law enforcement, Water law, Legal aspects.
Identifiers: Rhine River (Germany).

Although the technology is presently available to curtail most river pollution, its implementation has been remarkably retarded. The main cause of this is improper river management. This is particularly true in the case of international rivers where the usual political and economic complications are intensified. The most famous scheme of river management and pollution control is that used by Germany in the Ruhr Valley. Proposed is a plan for international river management, emphasizing pollution control. The proposed plan calls for the establishment of a multi-national commission which will make a study of the water resources of the area, formulate an abatement scheme, and apportion the costs for implementation to each polluter. Provisions are included for user fees, criminal and civil penalties, industrial design plans and a land use planning commission. The plan also contains provisions to cover persons discharging wastes into the river following passage and implementation of the act. This entire process must operate with as little governmental involvement as possible. Furthermore, it must be more flexible than existing river management programs. (Brackins-Florida)
W73-03361

INTERNATIONAL CONTROL OF RIVER WATER POLLUTION,
F. V. Witaschek.
The Denver Journal of International Law and Policy, Vol 2, p 35-54, 1972. 2 fig, 1 chart, 29 ref.

Descriptors: *International law, *Watershed management, *River basin development, *Water pollution control, International commissions, River basins, River basin commissions, Water pollution sources, Reasonable use, Water resources development, Municipal wastes, Industrial wastes, Waste disposal, Waste treatment, Water utilization, Water policy, Pollution abatement.
Identifiers: *Equitable utilization doctrine.

Basic principles and doctrines which have evolved for legal and administrative control of water resources in the United States and internationally are discussed. The history of river pollution and the development of water pollution controls are also explored. Four basic theories concerning the rights of coriparians to utilize the waters of an international river are set forth. Of these the most significant is the 'limited territorial sovereignty' theory, or reasonable use theory. This principle is the forerunner of, and inherent in, the 'equitable utilization' doctrine applied to arbitrate today's conflicts and disputes. This doctrine balances the interests of coriparians using criteria such as economic and social needs of each country, the inherent right of each to a reasonable use of the

water, pre-existent agreements among the states concerned and pre-existent appropriation of water by one state. This doctrine can also be used to control pollution; it curtails use by a state which would result in a material detriment to a coriparian. The growing scarcity of water and the increase of types and amounts of recognized pollution activities have resulted in a recent impetus toward creation of joint administrative agencies and treaties among co-basin nations. (Brackins-Florida)
W73-03362

POLLUTION OF THE GREAT LAKES: A JOINT APPROACH BY CANADA AND THE UNITED STATES,
G. E. Pratt.
California Western International Law Journal, Vol 2, p 109-127, 1971. 76 ref.

Descriptors: *Great Lakes, *International Joint Commission, *Water pollution control, *Treaties, *International law, United States, Canada, Great Lakes Region, Pollution abatement, Legal aspects, State governments, Government finance, Ownership of beds, International conventions, Coordination.
Identifiers: Canada Water Act of 1970.

In 1912 the United States and Canada formed the International Joint Commission (IJC) to study water pollution in the Great Lakes. Since this time the IJC has submitted three studies. The Commission, however, has no power to enforce its recommendations, to codify legislation, or even to coordinate activities between the United States and Canada. Nor have unilateral measures been successful. The United States has tried to allow the states to fight pollution with federal grants, but this has proven inadequate. Canada did not have an effective water pollution control measure until 1970 when the Canada Water Act was enacted. Furthermore, neither the principles of international law, with their emphasis on sovereign control over territorial waters, nor a treaty calling for mandatory arbitration or adjudication can provide a workable solution. What is needed is to increase the powers of the IJC, or to vest the powers in a new agency which would be able to coordinate the pollution control efforts of all government agencies of each country. A coordinated effort by both the United States and Canada is the only answer to the current pollution problem of the Great Lakes. (Brackins-Florida)
W73-03363

LIQUID SWEEPING SYSTEM EMPLOYING HELICAL CONVEYOR METHOD AND APPARATUS,
K. D. Brown.
U. S. Patent No. 3,618,768, 6 p, 17 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 892, No 2, p 573, November 9, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, *Pollution abatement, Abatement, Water pollution control, Water pollution treatment, Water quality control, Separation techniques.

A helical or screw type conveyor is used in a system for the removal of oil from the surface of a body of water. The system includes two motor-driven vessels between which a length of the conveyor is supported and allowed to float on the water. One end of the conveyor is attached to one of the vessels by a universal pivot and the other end is attached to be driven by a motor in the other vessel. During operation the cable is rotated in a direction to move fluid along the cable toward the driven end of the cable. To raise the collected oil to the reservoir the end of the cable is surrounded with a suitable tubing providing a spiral pump to lift the oil into the vessel and deliver it to the collection reservoir. (Sinha-OEIS)
W73-03366

OIL SKIMMER,
L. E. Trimble.
U.S. Patent No 3,608,728, 3 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 890, No 5, p 1466, September 28, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Abatement, *Pollution abatement, Equipment, Water pollution, Water pollution control, Water pollution treatment, Water quality, Water quality control, *Skimming.
Identifiers: *Oil skimmers.

A cylindrical float is mounted to a frame so that the float may rotate with its axis parallel to the surface of the water. The second float rotates and actuates a bellcrank and connecting rod system to rotate the cylindrical float. A scraper removes the oil collected on the surface of the float and allows it to drain down the trough into a drainpipe that will transport the oil to a storage vessel. A push-bar frame is attached to the second float and the entire apparatus is pushed by a boat. The resulting motion through the water actuates a paddle wheel to rotate the skimmer float to pick up oil from the water surface. (Sinha-OEIS)
W73-03371

APPARATUS FOR REMOVING OIL AND DEBRIS FROM WATER,
Standard Oil Co. (Indiana), Chicago, Ill.
J. F. Grutsch, and R. C. Mallatt.
U.S. Patent No 3,608,727, 3 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 890, No 5, p 1465, September 28, 1971.

Descriptors: *Patents, Equipment, *Oil spills, *Oil pollution, Flotsam, Separation techniques, Water pollution, Water pollution control, Water pollution treatment, Water quality, Water quality control, *Pollution abatement.

The apparatus consists of an endless chain made up of a series of interconnected foraminous chambers which hold a regenerable porous filter material such as polyurethane. Buckets are attached to the chain and as the chain moves through a closed loop path, the buckets catch debris and dump it into a holding bin. The filter material absorbs surface and subsurface oil and is regenerated by squeezing that releases the oil. (Sinha-OEIS)
W73-03372

BUOYANT BARRIER AND METHOD FOR INSTALLING THE SAME,
Versatech Corp., Nesconset, N.Y. (assignee).
J. E. Manuel.
U.S. Patent No 3,608,316, 6 p, 19 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 890, No 5, p 1363, September 28, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Abatement, *Pollution abatement, Barriers, Water pollution, Water pollution control, Water pollution treatment, Water quality, Water quality control.

The barrier structure is formed of flexible material so that a first portion defines at least one gas-inflatable buoyancy chamber extending for the length of the structure. A second portion defines a water chamber when the structure is deployed on water with the buoyancy chamber or chambers inflated. The structure can be delivered to a remote location and used to confine the spread of an oil spill. (Sinha-OEIS)
W73-03373

OIL SLICK REMOVAL SYSTEM,
A. Sohnius.
U.S. Patent No 3,607,741, 4 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 890, No 4, p 1230, September 21, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Treatment, Abatement, *Pollution abatement, *Cellulose, Water pollution, Water pollution control, Water pollution treatment, Water quality, Water quality control.

Physical gathering materials with an affinity for oil are chemically treated to render them hydrophobic. A mass of pieces of finely divided, oil absorptive and adsorptive cellulosic material having air cells for flotation, and resilient fiber content to prevent compaction of the mass is encased by an exterior netting which maintains coherence of the mass. (Sinha-OEIS)
W73-03375

OIL OR GAS POLLUTION CONTROL APPARATUS AND METHOD,
J. D. Mozic.
U.S. Patent No 3,602,299, 5 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 889, No 5, p 1487, August 31, 1971.

Descriptors: *Patents, *Oil spills, *Leakage, *Oil pollution, Oil wells, Offshore platforms, Equipment, Abatement, *Pollution abatement, Water pollution control, Water quality control, Water quality.

This invention involves the intentional ignition of escaping oil or gas to preclude the necessity for its removal. A device is provided to lift the gas or oil flame from the open end of the ruptured pipe. A screen is so designed as to pass fluid which is issuing under pressure from the rupture to a region above the screen. The screen is formed with heat dissipating fins and coolant fluid conduits set normal to each other to define openings through which the fluid can pass. (Sinha-OEIS)
W73-03380

DEVICE FOR CONFINING OIL RELEASED BY LEAKAGE DURING OFFSHORE OIL DRILLING OPERATIONS,
L. Missud.
U.S. Patent No 3,599,434, 4 p, 9 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 889, No 3, p 762, August 17, 1971.

Descriptors: *Patents, *Oil spills, *Leakage, *Oil pollution, Oil wells, Offshore platforms, Drilling, Water quality control, Water pollution control, Water pollution, Water quality, Abatement, *Pollution abatement, Equipment.

An assembly of tube and skirt is made to encircle an offshore drilling rig. Lift canisters are connected to the tube. Each canister has a perforated wall and an inner inflatable bag. When the bag is inflated, the expansion forces water out through the perforations and the canisters rise to a floating position bringing the tube upward into its floating position. The skirt is connected by drawstrings to a winch on the rig platform. When necessary it is released to form an oil-confining cylindrical wall. (Sinha-OEIS)
W73-03381

CHEMICAL OXYGEN DEMAND WATER ANALYZER,
Rederi A.B. Nordstjernan, Nynashamm (Sweden).
For primary bibliographic entry see Field 05A.
W73-03388

APPARATUS FOR PREVENTING OFFSHORE OIL WELL POLLUTION,
L. M. Lejeune.
U.S. Patent No 3,674,150, 3 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 900, No 1, p 147, July 4, 1972.

Descriptors: *Patents, *Oil pollution, *Oil wells, *Leakages, Underwater, Pipelines, *Oil spills,

Equipment, Abatement, *Pollution abatement, Water pollution control, Water pollution, Water quality, Water quality control.

This device includes a conical bottom wall with an opening at the top through which the oil can flow. A valve is used to close the oil spout. The oil is collected in a sump from which it can be pumped to shore or to a tank on a barge. The device allows the escape of high pressure gases while preventing the escape of oil. If necessary extinguishing gases such as carbon dioxide and nitrogen can be pumped in to extinguish fires. (Sinha-OEIS)
W73-03390

AIR DIFFUSION APPARATUS FOR THE TREATMENT OF POLLUTED WATER,
For primary bibliographic entry see Field 05D.
W73-03395

CONTRIBUTION OF FERTILIZERS TO THE POLLUTION OF WATERS IN THE NORTH CAROLINA COASTAL PLAIN,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 05B.
W73-03402

CONTROLLED DISCHARGE FROM THE W.P. FRANKLIN DAM AS A MEANS OF FLUSHING SALINE WATER FROM THE FRESH-WATER REACH OF THE CALOOSAHATCHEE RIVER, LEE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
D. H. Boggess.
Geological Survey Open-file Report 72028, 1972. 45 p, 11 fig, 2 tab, 1 ref.

Descriptors: *Saline water intrusion, *Tidal streams, *Locks, *Water quality control, *Florida, Dams, Flow control, Floodgates, Navigation, Salinity, Flow augmentation, Saline water-freshwater interfaces.
Identifiers: *Caloosahatchee River (Fla), Saline water flushing, Freshwater reach, W.P. Franklin Dam (Fla).

During low flow, saline water from the tidal reach of the Caloosahatchee River in Lee County, Florida, moves upstream during the lockage of boats at the W.P. Franklin Dam, causing a progressive net increase in the chloride content of the fresh river water. Tests were conducted in March 1971 to determine the feasibility and effectiveness of flushing saline water downstream by controlled opening of the automatic gate. During the test with the 0.5-foot gate opening on March 8-12, the discharge rate averaged about 180 cfs, whereas during the test with the 1.0-foot gate opening on March 15-17, the discharge rate averaged about 350 cfs. About 2,810 acre-feet of water was discharged during both test periods. The average chloride concentration in water at shallower depths between the Franklin Dam and the Alva bridge decreased 49 mg/liter between March 8 and 15 during and after the discharge with the 0.5-foot gate opening, and further decreased 35 mg/liter between March 15 and 17 during the discharge with the 1.0-foot gate opening, for a total decrease of 84 mg/liter. (Woodard-USGS)
W73-03405

GEOTHERMAL EXPLORATION IN REGION 3 (IMPERIAL VALLEY PROJECT).
Bureau of Reclamation, Boulder City, Nev. Region 3.
For primary bibliographic entry see Field 03B.
W73-03422

QUARTERLY PROGRESS REPORT, JULY 1 - SEPTEMBER 30, 1972.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.

(1972), 71p.

Descriptors: *Water pollution, Pollutants, *Eutrophication, *Nutrients, *Water pollution control, *Water analysis, *Thermal pollution, *Waste treatment, *Industrial wastes, Projects.

A quarterly view of the activities, both intramural and extramural, of the Pacific Northwest Environmental Research Laboratory is presented. Research on the behavior of pollutants in the marine environment by the National Coastal Pollution Research Program is reported. A report by the National Eutrophication Research Program is presented on the euthrophication process in polluted water and development of methods and technology for control and restoration of euthrophic waters. A study to identify and analyze waters in the United States with actual or potential eutrophication problems from discharges causing excessive amounts of nutrients is discussed by the National Eutrophication Survey Program. The causes, effects, controls, and prevention of thermal water pollution is covered by the National Thermal Pollution Research Program. Waste treatments for pulp and paper, wood products, forestry and logging, and food processing industries are reviewed, along with the activities of the Consolidated Laboratory Serivce. (Ensign-PAI)
W73-03444

A BIBLIOGRAPHY ON MARINE AND ESTUARINE OIL POLLUTION.
Marine Biological Association of the United Kingdom, Plymouth (England). Library.

September 1971. D. S. Moulder and A. Varley, compilers. 129 p, 1073 ref., Price: 3 pounds.

Descriptors: *Bibliographies, Oil, Sea water, *Estuaries, *Oil pollution, Water pollution sources, Water pollution control, Water analysis, *Pollutant identification, Water pollution effects, *Oil spills, *Treatment, *Cleaning, Legal aspects, Research and development, Conferences.

References to almost 1100 papers on marine and estuarine oil pollution published over the past 100 years are contained in this bibliography. Sources of oil pollution and their control; properties of oil; oil detection; analysis and identification of oil; reports on particular spills; biological effects of oil; method of treatment and containment; emergency procedures; and the legal aspects of oil pollution are included. There are also sections on research and development; bibliographies; conferences; general reports; and miscellaneous papers and general discussions. (Ensign-PAI)
W73-03451

DESALINATION OF AGRICULTURAL TILE DRAINAGE.
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05D.
W73-03501

A FREE FLOATING ENDLESS BELT OIL SKIMMER,
Rex Chainbelt, Inc., Milwaukee, Wis.
R. W. Agnew.
Copy available from GPO Sup Doc as EP1.23/2:72-006, $1.50; microfiche from NTIS as PB-214 103, $0.95. PC$3.50. Environmental Protection Agency report EPA-R2-72-006, August 1972. 93 p, 39 fig, 11 tab, 18 ref, 2 append. EPA Project 15080 GBJ. Contract 14-12-908.

Descriptors: *Skimming, *Oil spills, Oil pollution, *Water pollution control, *Sorption, Pollution abatement.
Identifiers: *Oil skimmers, *Conveyor belts, Polyurethane foams.

A free floating endless belt oil skimmer was developed as a means of recovering spilled oil from surface waters. The skimmer utilizes a unique high efficiency conveyor wringer to power and wring the belt. The belt is designed to float on the water surface and responds rapidly to the shape of the waves, thereby maximizing oil-sorbent contact time. Evaluation of the skimmer was conducted in a 60 foot diameter annular test tank under the conditions of slightly progressive waves having an amplitude of two feet. One foot wide neoprene backed polyurethane foams were utilized as the sorbent material. The experimental results indicate that the oil pickup rates will vary with the belt speed, oil slick thickness and belt porosities. Oil pickup rates of 8.3 and 3.7 gpm per foot of belt width were attained for No. 2 Fuel Oil and Bunker C oil respectively at a slick thickness of 0.10 inches. The recovered liquid contained approximately 50-70 % oil at 0.10 inch slick thickness. A conceptual design of a five foot wide boat mounted skimmer capable of harvesting approximately 5 acres per hour of spilled oil is presented. (EPA abstract)
W73-03504

PYRITIC SYSTEMS: A MATHEMATICAL MODEL,
Ohio State Univ., Research Foundation, Columbus.
For primary bibliographic entry see Field 05B.
W73-03506

QUANTITATIVE METHODS FOR PRELIMINARY DESIGN OF WATER QUALITY SURVEILLANCE SYSTEMS,
Raytheon Company. Portsmouth, Rhode Island, Environmental Systems Center.
For primary bibliographic entry see Field 05A.
W73-03507

SELECTED IRRIGATION RETURN FLOW QUALITY ABSTRACTS 1968-1969,
Robert S. Kerr Water Research Center, Ada, Okla.
G. V. Skogerboe, V. T. Sahni, and W. R. Walker.
Copy available from GPO Sup Doc as EP1.23/2:72-094, $2.75; microfiche from NTIS as PB-214 105, $0.95, and PC $5.25. Environmental Protection Agency report EPA-R2-72-094, October 1972. 211 p. EPA Project 13030 FVN.

Descriptors: Fertilizers, Irrigated land, Irrigated systems, *Irrigation water, Nitrates, Phosphates, *Return flow, Salinity, Water pollution effects, Water pollution sources, *Water quality control, *Abstracts, *Bibliographies.

Research related to the quality of irrigation return flow is being conducted at numerous institutions throughout the western United States. Related work is also underway at other institutions in the United States, as well as other portions of the world. Approximately 100 sources of material have been searched for over 400 articles pertinent to the National Irrigation Return Flow Research and Development Program. These articles describe water quality problems resulting from irrigated agriculture, potential technological solutions for controlling return flows, recent research pertinent to return flow investigations, and literature associated with institutional constraints in irrigation return flow quality control. (EPA abstract)
W73-03508

FEASIBILITY STUDY OF ELECTROMAGNETIC SUBSURFACE PROFILING,
Geophysical Survey Systems, Inc., North Billerica, Mass.
For primary bibliographic entry see Field 08G.
W73-03509

STORAGE AND TREATMENT OF COMBINED SEWER OVERFLOWS.
Environmental Protection Agency, Minneapolis, Minn. Lake Superior Basin Office.
For primary bibliographic entry see Field 05D.
W73-03514

CONTROLLING THERMAL POLLUTION ON SMALL STREAMS,
National Environmental Research Center, Corvallis, Oreg.
G. W. Brown, and J. R. Brazier.
Copy available from GPO Sup Doc as EP1.23/272-083, $1.25; microfiche from NTIS as PB-213 901, $0.95. Environmental Protection Agency report EPA-R2-72-083, October 1972. 64 p, 11 fig, 4 tab, 34 ref, append. EPA Project 16130 FOK.

Descriptors: *Thermal pollution, Water temperature, *Lumbering, Forestry, Clear-cutting, *Oregon, *Canopy.
Identifiers: *Buffer strips (Canopy).

Buffer strips have been proposed as a method for controlling temperature changes in streams adjacent to clear-cuttings. Nine small mountain streams in Oregon's Coast Range and Cascade Mountains were studied to determine the influence of buffer strips on water temperature. Timber volume in the strip, strip width, and canopy density perpendicular to the sun's rays were compared to the effectiveness of the strip in controlling temperature change. This effectiveness was not well correlated with timber volume or strip width. The density of the canopy in the path of the sun is the most important buffer strip characteristic for water temperature control. A method for measuring the density of the canopy in the path of the sun is described. The use of this method in the design of buffer strips will provide protection for the stream and maximum harvesting of the timber resource. (EPA abstract)
W73-03516

CONTROL OF MERCURY CONTAMINATION IN FRESHWATER SEDIMENTS,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05D.
W73-03517

EVALUATION OF CANAL LINING FOR SALINITY CONTROL IN GRAND VALLEY,
Robert S. Kerr Water Research Center, Ada, Okla.
G. V. Skogerboe, and W. R. Walker.
Copy available from GPO Sup Doc as EP1.23/272-047, $2.75; microfiche from NTIS as PB-214 113, $0.95. Environmental Protection Agency report EPA-R2-72-047, October 1972. 199 p, 59 fig, 36 tab, 39 ref. EPA Project 13030 DOA 14-01-201.

Descriptors: *Colorado River, Irrigation, *Irrigation canals, Irrigation effects, Irrigation efficiency, Irrigation water, *Return flow, Saline soils, Saline water, Salinity, Seepage, Water distribution (Applied), Water loss, Water pollution sources, Water quality, *Canal linings.
Identifiers: *Grand Valley (Colo), *Salinity control.

Introduction of seepage and deep percolation losses to the saline soils and aquifers, and the eventual return of these flows to the Colorado River with their large salt loads, make the Grand Valley in Colorado one of the more significant salinity sources in the Upper Colorado River Basin. The Grand Valley Salinity Control Demonstration Project was designed to evaluate the salinity control effectiveness of canal and lateral linings for reduction of seepage losses into the ground water. A detailed evaluation of the necessary hydrologic and salinity parameters in the principal demonstration area was made. A hydrosalinity model has been prepared, which has allowed the itemizing of the various segments of the dual flow system into water and salt budgets for the periods prior to and immediately after the construction of the linings. In addition, the results of this study and others conducted previously were employed to derive some generalized valley-wide water and salt budgets. The salinity control benefits to the Lower Basin exceeded the costs of the canal lining program. (EPA abstract)
W73-03518

CHARACTERISTICS OF RAINFALL RUNOFF FROM A BEEF CATTLE FEEDLOT,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 05B.
W73-03520

LOGGING AND WATER QUALITY IN THE PACIFIC NORTHWEST,
Oregon State Univ., Corvallis. School of Forestry.
For primary bibliographic entry see Field 04C.
W73-03551

SOURIS-RED-RAINY RIVER BASINS COMMISSION, ANNUAL REPORT FISCAL YEAR 1971.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03559

WATER POLLUTION,
A. W. Reitze, Jr.
In: Environmental Law, p four-1 thru four-154, App. 4-1 thru App. 4-20, North American International, Washington, D.C., 1927. 155 p, 1 photo, 8 tab, 148 ref.

Descriptors: *Water pollution control, *Water pollution sources, *Water pollution effects, *Legislation, Waste disposal, Waste treatment, Grants, Government finance, Water supply, Federal Water Pollution Control Act, Rivers and Harbors Act, Judicial decisions, Legal aspects, Watercourses (Legal aspects), Water law, Permits, Federal government, State governments, Local governments, Waste disposal wells, Injection wells, Sewage disposal, Law enforcement, Penalties (Legal).
Identifiers: Refuse Act of 1899.

Water pollution and water pollution control efforts on the federal, state and local levels are analyzed. The discussion includes sources and types of pollutants, the collection and treatment of wastes, costs of water pollution, eutrophication and the problem of phosphates and problems of pollution in public water supplies. Beginning with a history of federal water pollution control efforts, the study goes on to discuss pending legislation and existing legislation. The Federal Water Pollution Control Act is included in its full text with a section-by-section commentary. Also included is the Rivers and Harbors Appropriations Act of 1899 with several edited federal court decisions on the Act. The Refuse Act and the Refuse Act Permit Program are also discussed. The enforcement of this Act is in doubt due to recent judicial decisions. Proposed legilsation will supersede part of the Refuse Act. State pollution control efforts, state financing and local regulation are also analyzed. Deep-well injection of liquid wastes also is discussed. (Brackins-Florida)
W73-03562

MARITIME UNIFORMITY VERSUS COMPELLING STATE INTEREST IN CONTROLLING OIL POLLUTION OF NAVIGABLE WATERS,
W. C. Hoyer.
University of Florida Law Review, Vol 24, p 789-795, 1972. 58 ref.

Descriptors: *Florida, *Oil spills, *Legislation, *Oil pollution, *Judicial decisions, Water pollution, Water pollution control, Coasts, Water quality, Compensation, Legal aspects, Water law, Governments, Water pollution sources, Oil, International waters, Navigable waters, Oil wastes, Oil spills, Water Quality Act.
Identifiers: *Maritime uniformity, *Oil Pollution Act, Coastal waters, Absolute liability.

A federal district court has held that the Florida Oil Spill Prevention and Pollution Control Act (1970) is an unconstitutional intrusion into the federal maritime domain. The court determined that the strict and unlimited liability provisions of the Act not only contravened federal legislation concerning clean-up costs, but also transgressed maritime uniformity with respect to property damage liability. The court permanently enjoined enforcement of the Act. Although the holding is warranted and even dictated by prior interpretations of maritime uniformity, the instant decision merely reiterates and does not justify the present need for such inviolate uniformity. Uniformity would not be fatally abridged by 'balancing the State's interests' against the need for federally imposed uniformity. The present power of shipping interests, andrb oil pollution directs a judicial the need for states, espically tourist states, to cu shift to strict liability, either through declaring oil pollution an absolute nuisance or the shipping of oil an ultrahazardous activity. Barring this, Congress must abolish legislative limitations on liability, substitute strict enforcement for voluntary compliance and provide relief for private property damage resulting from oil pollution. (Tolle-Florida)
W73-03568

CLARION RIVER ACID MINE DRAINAGE ABATEMENT PROGRAM, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.

Available from the National Technical Information Service as EIS-PA-72-4585-D, $3.00 in paper copy, $0.95 in microfiche. May 1972. 15 p.

Descriptors: *Pennsylvania, *Environmental effects, *Acid mine water, *Mine drainage, Reclaimed water, Pollution abatement, Water quality, Water supply, Water flow, Impoundments, Reclamation, Land reclamation, Recreation, Fishing, Watersheds (Basins), Surface waters, Surface drainage, Water pollution sources, Water quality control, Water pollution control, Land management.
Identifiers: *Environmental Impact Statements, *Clarion River (Pa).

The proposed project consists of pollution abatement and land reclamation measures in the Clarion River Basin, Pennsylvania. The area currently is beset with serious water quality problems as a result of extensive acid mine drainage. The program is directed towards control of mine drainage pollution from abandoned mines and oil and gas fields in the area. To accomplish the purposes of the project, acid sources will be abated with lands reclaimed by deep mine seals, grout curtains, surface water diversion ditches, and removal or neutralization and demineralization of mine drainage. The results are expected to by 75% effective. In addition to water quality improvement environmental effects include increased water supply for municipal and industrial needs; recreational and fishing enhancement, though marginal initially; and potential inclusion of the Clarion

River within the program of federal Wild and Scenic River Act. Adverse effects include temporary disruption of land and water areas during structural implementation of the program. Alternatives considered were no-action and the proposed action altered in scope to a greater or lesser degree. (Bradley-Florida)
W73-03569

THE SUPREME COURT AND THE ENVIRONMENT: A NEW ROLE FOR THE 1970'S.,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 06E.
W73-03570

FOURTH ANNUAL CONFERENCE, STATE AND FEDERAL WATER OFFICIALS: LAND AND WATER ISSUES OF THE SEVENTIES.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03571

DEPARTMENT OF DEFENSE ENVIRONMENTAL QUALITY PROGRAM.
Office of the Deputy Assistant Secretary of Defense for Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03572

PROPOSED CONCRETE LINING OF MAIN OUTLET DRAIN, SOUTH GILA VALLEY, COLORADO RIVER FRONT WORK AND LEVEE SYSTEM, ARIZONA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boulder City, Nev. Region 3.
For primary bibliographic entry see Field 08A.
W73-03574

CANYON LAKES PROJECT, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Recreation, Washington, D.C.
For primary bibliographic entry see Field 06B.
W73-03575

ABSTRACTION AND USE OF WATER: A COMPARISON OF LEGAL REGIMES.
Department of Economic and Social Affairs (UN), New York.
For primary bibliographic entry see Field 06E.
W73-03576

HAWKINSON V. BLANDIN PAPER CO. (DAMAGES SOUGHT FOR WASTE DISPOSAL IN RIVER).
For primary bibliographic entry see Field 06E.
W73-03578

STATE AND LOCAL WETLANDS REGULATION: THE PROBLEM OF TAKING WITHOUT JUST COMPENSATION.
For primary bibliographic entry see Field 06E.
W73-03580

BITUMEN IN THE WATERS OF BABYLONIA: THE IMPACT OF RECENT LEGISLATION ON THE LIMITED LIABILITY ACT OF 1851,
For primary bibliographic entry see Field 06E.
W73-03581

WATER QUALITY STANDARDS SUMMARY FOR INTERSTATE WATERS IN THE DISTRICT OF COLUMBIA.
District of Columbia Dept. of Public Health, Washington.
Environmental Protection Agency. Doc. No. WQS 11-001, 1972. 17 p, 2 map, 1 fig.

Descriptors: *Interstate rivers, *Water resource development, *District of Columbia, *Water utilization, *Water quality control, Optimum development plans, Regional development, Water conservation, Natural resources, Area redevelopment, Comprehensive planning, Water pollution, Water pollution effects, Water pollution control, River regulation, Rivers, Potomac River.

The general aim in the summary designation of uses for the District of Columbia's interstate waters is to recognize present and future uses, to provide a variety of uses, and to assure compatibility with federal, state and local resource planning standards. There are no waters within the District whose existing quality is better than the quality indicated by the established standards. Therefore the policy of the District is to improve the quality of all its waters by requiring proper waste treatment from all new pollution sources. The following district wastes are listed in the summary with water uses and stream criteria designated: Potomac River, Rock Creek, Anacostia River and Oxen Run. Included is the implementation plan which deals with controlling water pollution in general, combined sewer overflows and storm water, advanced waste treatment, industrial waste waters, waste from vessels, land erosion and floating debris. (Beardsley-Florida)
W73-03583

WASTE DISPOSAL IN THE COASTAL WATERS OF NEW YORK HARBOR.
Hearing--Subcomm. on Rivers and Harbors--Comm. on Public Works, U.S. House of Representatives, February 23, 1970. 112 p, 1 plate, 26 photo, 1 tab, 8 chart.

Descriptors: *Legislation, *Waste disposal, *Sewage sludge, *New York, *Water pollution control, Waste water disposal, Waste water (Pollution), Acidic water, Sludge, Sanitary engineering, Legal aspects, Water, Water pollution, Sediments, Benthos, Phytoplankton, Coasts, Navigable rivers, Permits, State governments, New Jersey, Discharge (Water).
Identifiers: *New York Harbor.

This hearing took testimony on amendments to the act of June 29, 1888, relating to the prevention of obstructive and injurious deposits in New York Harbor. The amendments would terminate all permits and licenses which allowed waste disposal in the New York Bight Waters of New York Harbor. The Governor of New Jersey presented material on sludge barging to the sea. The Citizens Against Water Pollution presented their policy statement on sewage treatment plant sludge disposal. The Sandy Hook Marine Laboratory of the Department of the Interior presented a Study of the Effects of Waste Disposal in the New York Bight Area including: water analyses, sediment analyses, tissue analyses, benthic studies, pelagic studies, and hydrographic studies. Grab sample slides showing the effects of disposal and human pollution in the area are also included. (Tolle-Florida)
W73-03589

RURAL DEVELOPMENT ACT OF 1972.
For primary bibliographic entry see Field 06E.
W73-03596

SCHERR V. VOLPE (APPLICATION OF NEPA TO HIGHWAY CONSTRUCTION IN WATERSHED).
For primary bibliographic entry see Field 06E.
W73-03599

AMENDMENT OF FEDERAL WATER POLLUTION CONTROL ACT (S. 2770).
For primary bibliographic entry see Field 06E.
W73-03600

NATURE AS A POLLUTER,
House, Washington, D.C.
For primary bibliographic entry see Field 04D.
W73-03602

NONPOINT SOURCE POLLUTION FROM AGRICULTURAL, RURAL AND DEVELOPING AREAS,
House, Washington, D.C.
J. Kee.
Congressional Record, Vol 118, p H5839-H5849 (daily ed.) June 20, 1972. 11 p.

Descriptors: *Water pollution sources, *Legislation, *Watershed management, *Sediment control, Water pollution control, Surface runoff, Pollution abatement, Surface drainage, Land use, Erosion control, Legal aspects, Land management, Sediment transport, Agricultural runoff, Agricultural watersheds, Agricultural chemicals, Mine wastes, Strip mine wastes.

The greatest source of water pollution is nonpoint pollution from agricultural, rural and developing areas. Nonpoint source pollution is created by soil erosion, erosion from both water runoff and wind-blown dust. H.R. 15596 is being introduced in order to rectify this problem. This bill authorizes the Secretary of Agriculture to enter into agreements with state and local officials in planning for watershed programs. The Secretary may also enter into agreements binding for up to ten years with owners and occupiers of land covering areas such as engineering operations, methods of cultivation and waste treatment facilities. He may furnish financial and other assistance as he decides, and he may make loans under contract for the federal share of the costs. The agreements may cover five areas: farm and ranches, developing rural and urban areas, roadsides and related areas, tributaries of major rivers and lands damaged by strip mines. Where it is found that the landowner is causing pollution, all assistance from any federal program will be withdrawn. Pollution from animal wastes, agricultural fertilizers and pesticides, mineral salts, strip mining and other chemicals is discussed. (Brackins-Florida)
W73-03603

THE OCEAN DUMPING BILL,
Senate, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03604

AERATION,
Simon-Carves Ltd., Stockport (England). (assignee).
For primary bibliographic entry see Field 05D.
W73-03615

LIMITING CONTAMINATION OF WASTE DISPOSAL WELLS,
Marathon Oil Co., Findlay, Ohio. (assignee).
For primary bibliographic entry see Field 05E.
W73-03616

THE AMELIORATION OF AN ACIDIC MINE SPOIL BY LIQUID DIGESTED SEWAGE SLUDGE,
Metropolitan Sanitary District of Greater Chicago, Ill.
J. R. Peterson, and J. Gschwind.
Preprint, October 30, 1972. 25 p, 5 fig, 3 tab, 23 ref.

Descriptors: *Coal mine wastes, *Mine drainage, *Water pollution control, *Sludge, Soil erosion,

Leaching, Laboratory tests, Neutralization, Sludge disposal, Sewage sludge, Municipal wastes, Heavy metals, Illinois.
Identifiers: *Chicago.

Two major problems associated with acidic coal mine spoils are soil erosion and local water pollution. Erosion results from the inability of vegetation to take root in the acidic material, and pollution is from the oxidation of iron sulfides to sulfuric acid, which has the added effect of dissolving metals which subsequently are leached into water supplies. The use-of digested sewage sludge to counteract the mine acid pollution problem attacks both these problems. The nutrient-rich sludge allows the growth of vegetation. The leachage from a sludge-spoil mixture has been found to be chemically purer even without the vegetative cover. In tests with four plexiglass columns of acidic coal mine spoilage and varying quantities of sludge, distilled water was leached through the columns and analyzed. In the column where the sludge and spoil were thoroughly mixed at a ratio of 1:37, by weight, the pH changed from the control of 2.5 to 4.8. Cation exchange capacity was increased, as well as exchangeable calcium and magnesium. There was almost a total elimination of exchangeable aluminium. The toxic properties of the spoil was eliminated by the sludge treatment and was basically accomplished by the sludge solids, although the soluble portions of the sludge can also increase pH and reduce exchangeable aluminium. High sludge application rates with poor drainage can cause metal mobilization, but good drainage and aeration of the sludge-spoil mixture will not only permit higher sludge application rates but will retard mineral decomposition as well as contribute to general soil fertility and tilth.
W73-03633

REPORT ON COMPREHENSIVE SYSTEM DESIGN FOR WATER QUALITY MANAGEMENT INFORMATION SYSTEM.
Pennsylvania Dept. of Environmental Resources, Harrisburg. Bureau of Sanitary Engineering.

Publication Number 28, Harrisburg, June 1970. 30 p.

Descriptors: *Data collections, *Systems analysis, *Information systems, *Methodology, Water quality control, Water management (Applied), Pennsylvania, Decision making, Management engineering, Systems engineering.

With the ever-increasing amount of data being obtained on water supplies, the handling of this data is becoming ever-increasingly complex. Too often pollution episodes are recorded only after the fact. With a good monitoring and data processing system, potential pollution episodes should be predictable and prevented from becoming major disasters. In order to develop a system of data compilation, the Commonwealth of Pennsylvania contracted with Price-Waterhouse and Company to assist in a water resources quality management program. Major project goals here two -fold: (1) to provide a demonstration system which will be available for use by interested federal, state and interstate water pollution control agencies, and (2) to provide the basis for a training program in management data systems at various levels of government. Working on a regional system, data sources are coded and data fed into a computer program, STORET I, the storage and retrieval system developed under the auspices of the FWQA. It is a river-mile indexing system that allows a particular point on any waterway in the United States to be identified. Another program STORET II, compliments STORET I. Along with the development of the data storage and retrieval system, a systems approach to general water quality protection was developed, describing the steps of permit programs testing programs, water usuage, plant operation and so forth. The data storage and retrieval system should provide the information necessary for a total comprehensive water quality program when implemented by the systems approach to water quality management. (Poertner)
W73-03646

THE FEDERAL WATER REPORT AND ITS IMPACT ON VERMONT'S PUBLIC WATER SUPPLIES,
Vermont State Dept. of Health, Montpelier. Div of Environmental Health.
For primary bibliographic entry see Field 05F.
W73-03667

CAN STATES PAY MORE,
Utah Water Research Lab., Logan.
D. H. Hoggan.
Water and Wastes Engineering, Vol 9, No 5, p 63-64, 75-78, May 1972. 3 ref.

Descriptors: *Water supply, Sanitary engineering, *Investment, Federal government, *State governments, California, Louisiana, *Water resources development, *Financing, Government finance.

In face of the increasingly acute situation, state and local governmental agencies will have to abandon their ceilings on interest rates and indebtedness. To finance water projects, the states of California and Louisiana have (1) depended upon a variety of capital resources including special legislative appropriations, earmarked revenues, and long-term borrowing, (2) established special districts with taxing and borrowing powers, (3) signed contracts directly with the Federal Government for sharing costs of water projects, (4) borrowed relatively large amounts for water projects in spite of rather severe debt limitations, (6) guaranteed or given state backing to local agency bond issues to enhance their quality, (7) passed constitutional amendments to remove certain debt limitations and facilitate long-term borrowing, (8) streamlined the organization and procedures for issuing long-term debt, and (9) provided financial and technical assistance to local agencies for water resource development. A possible source of revenue for state water projects heretofore unemployed is a water-use fee. Long-term borrowing is another possible source not used by many states. In some states legal restrictions must be eliminated or modified to make the bonds more attractive. (Bean - AWWARF)
W73-03668

WATER SERVICES REORGANISATION IN ENGLAND AND WALES - GOVERNMENT PROPOSALS.
Water and Water Engineering (British), Vol 76, No 1, p 10-13, Jan 1972.

Descriptors: *Management, *Legislation, Water supply, Water reuse, Sewerage.
Identifiers: *Authorities.

Legislation is anticipated that will establish in 1974 all-purpose Regional Water Authorities, 9 in England and 1 in Wales, for both water and sewage services, with power to safeguard and promote all aspects of water and wastewater. This would cover water conservation, water supply, treatment and disposal of collected sewage, pollution control, provision of water-based recreation, and reclamation and reuse of wastewaters. Statutory water companies would continue to exist as agents of the new authorities - provided that satisfactory arrangements for such agencies can be made. Local authorities will retain sewerage functions, other than those required by the Regional Water Authorities to effect their duties. Admission of trade effluents will be under control of the Regional Authorities. Inland waterways will also be mainly their responsibility. Apart from grants for specific purposes, revenue for the Authorities to discharge their main functions should come from charges for services provided. Administrative costs for pollution control will be treated as part of the overall cost of providing and reclaiming water. Charges on abstractors from surface and underground sources, and for piped water will be retained. In each Authorities area one or more Consumer Councils wil be constituted. (Bean - AWWARF)
W73-03670

BALANCING NEEDS, RESPONSIBILITY, AND COSTS IN THE DISTRIBUTION SYSTEM--DISTRIBUTION STORAGE,
Black and Veatch, Kansas City, Mo.
D. P. Proudfit.
Journal of the American Water Works Association, Vol 62, No 10, p 629-633, Oct 1970. 2 fig, 1 tab.

Descriptors: *Water supply, *Distribution systems, *Pumped storage, *Pumping, *Water storage, Flow rates, Water demand, Water quality control.
Identifiers: Ground level storage, Elevated storage.

Sufficient elevated storage is practical and economically feasible only in relatively small systems, or in isolated areas and booster districts. Where suitable ground storage can be constructed at the hydraulic gradient elevation, it is generally favored as less costly. Distribution system storage is generally defined as all treated or finished water storage in the system including the plant clearwell. No storage can be considered standby storage unless it is gravity available or firm booster pumping facilities are provided. The latter implies a dual power source and pumping facility. Assuming firm production and primary pumping capacity are available to supply the maximum usage, the minimum desirable standby storage ratio is that ratio which will provide total standby storage to supply that portion of the maximum hourly demand in excess of maximum daily rate, for a 4-hr period with not more than 50 percent depletion of storage; or supply that portion of the 10-hr fire demand in excess of maximum daily rate, with not more than 67 percent depletion of storage, whichever is greater. (Bean-AWWARF)
W73-03671

BIOLOGY OF WATER POLLUTION: EFFECTS AND CONTROL,
Aston University, Birmingham (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W73-03673

THE UPTAKE AND PERSISTENCE OF PESTICIDES IN AN ALGAE-LADEN ENVIRONMENT,
Virginia Polytechnic Inst., Blackburg.
For primary bibliographic entry see Field 05B.
W73-03676

COPRECIPITATION OF ORGANIC COMPOUNDS FROM LAKE WATER BY IRON SALTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 05D.
W73-03678

IN-PLANT RESEARCH AT SPRINGFIELD, MISSOURI,
For primary bibliographic entry see Field 05D.
W73-03688

STOCHASTIC POPULATION PROJECTION AT DESIGN LEVEL,
Curran Associates, Inc., Northampton, Mass.
P. M. Meier.

Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA6, Paper 9436, p 883-896, December, 1972. 2 fig, 4 tab, 18 equ, 23 ref.

Descriptors: *Environmental engineering, *Pollution abatement, *Monte Carlo method, *Population, Forecasting, Simulation analysis, Planning, Mathematical models, Systems analysis, Design, Probability.
Identifiers: *Population growth, Population migrations.

A method for stochastic population projection for small areas is developed for use by consulting engineers as a basis for specifying the design capacity of pollution control facilities. Based on the components-of-change model for population growth and a formulation of demographic rates as first-order autoregressive processes, the proposed projection model specifies future population in terms of a probability distribution. Monte Carlo simulation rather than analytical solution is used to derive the probabilities. An analysis of the first results suggests a significant improvement in predictive accuracy over the traditional subjective or deterministic projection models still in widespread use by the environmental engineering profession. (Bell-Cornell)
W73-03691

OIL-SKIMMING APPARATUS,
Ocean Pollution Control, Inc., Dallas, Tex. (assignee).
H. J. Fitzgerald, and E. H. Koepf.
U. S. Patent No 3,612,280, 4 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 891, No 2, p 662, October 12, 1971.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Pollution abatement, Water pollution, Water pollution treatment, Water pollution control, Water quality, Water quality control.

A pair of wing assemblies are mounted at opposite sides of the hull of a marine vessel. Each of the wings has a cover of flexible sheet material that is impermeable and impervious to oil. The inner end of each wing is connected to the hull so that the wings are moveable. The oily waste passes under and is trapped by a skirt like section which helps to funnel the oil inward towards conduits which remove the oil. (Sinha-OEIS)
W73-03696

MAN'S IMPACT ON THE CLIMATE.
For primary bibliographic entry see Field 06G.
W73-03703

FOREST PRODUCTS POLLUTION CONTROL, ANNOTATED BIBLIOGRAPHY (EXCLUDING PULP AND PAPER),
Western Forest Products Lab., Vancouver (British Columbia).
M. Johnson.
Available from NTIS, Springfield, Va 22151 as PB-210 728; Price $3.00 printed copy; $0.95 microfiche. Canadian Forest Service Western Forest Products Laboratory Information Report VP-X-100, June 1972. 20 p.

Descriptors: *Bibliographies, *Pollution abatement, *Forestry, *Water pollution sources, Air pollution, Documentation, Abstracts, Information retrieval, Publications, Lumbering, Agriculture, Forest management, Pulp and paper industry, Pulp wastes, Wood wastes, Environmental effects.
Identifiers: Noise pollution.

This annotated bibliography, concerning forest products pollution control, contains 140 references. The categories for the documents are: general; air pollution due to manufacturing operations; air pollution due to logging operations; water pollution due to manufacturing operations; water and scenic pollution due to logging operations; and noise pollution due to logging and manufacturing operations. (Woodard-USGS)
W73-03746

NITROGEN MOVEMENT COMPARISONS IN CROPPED VERSUS FALLOWED SOILS,
Georgia Agricultural Experiment Station, Athens.
For primary bibliographic entry see Field 02G.
W73-03771

DISTRIBUTION OF INFECTIOUS HEPATITIS IN DERBENT (IN RUSSIAN),
For primary bibliographic entry see Field 05C.
W73-03803

AN IN VIVO STUDY ON ENAMEL FLUORIDE IN CHILDREN LIVING IN A FLUORIDATED AND IN A NONFLUORIDATED AREA,
Forsyth Dental Center, Boston, Mass.
For primary bibliographic entry see Field 05C.
W73-03805

STUDY OF OZONE TREATMENT OF THE DNIEPER WATER (IN RUSSIAN),
R. D. Gabovich, G. G. Rudenko, and M. A. Chaikovskaya.
Gig Sanit, Vol 36, No 10, p 13-17, 1971, Illus, English summary.
Identifiers: Chlorine, Dnieper, Filtration, *Ozone, *Water treatment, USSR.

The result of treatment of the Dnieper waters using an experimental ozone-filtration technique was compared with the efficiency of water treatment at the Kiev Dnieper water works. The use of O3 together with Cl was expedient for hygienic, technical and economical purposes. Details on the method of O3 treatment (the dose, the time of contact, the order of treatment) are given.--Copyright 1972, Biological Abstracts, Inc.
W73-03817

EFFECTIVENESS OF DEHELMINTHIZATION OF SEWAGE BY MECHANICAL PURIFICATION IN IRKUTSK (IN RUSSIAN),
Meditsinskii Institut, Irkutsk (USSR). Dept. of General Hygiene.
G. A. Shilin.
Med Parazitol Parazit Bolezn, Vol 40, No 4, p 494, 1971, English summary.
Identifiers: *Dehelminthization, Irkutsk, Purification, *Sewage treatment, USSR.

Results are summarized of a helminthological examination of sewage carried out in 1967-1969. The effectiveness of dehelminthization of sewage was 70-80% depending on the season of the year. One liter of unpurified sewage arriving at the purification plant contains an average of 19 eggs of helminths, while that of purified sewage contains 3-4 eggs.--Copyright 1972, Biological Abstracts, Inc.
W73-03820

REPORTS, HYDROLOGY, 1943, APPENDIX C -- REPORT ON RESEARCH IN THE FIELD OF GROUND WATER BEING CONDUCTED BY OIL COMPANIES,
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 04B.
W73-03845

THE SOIL AND ENVIRONMENTAL POLLUTION (IN NORWEGIAN),
Norske Skogforsoksvesen, Vollebekk. Skogokol. Avdeling.
O. Gjems.
Tidsskr Skogbruk. Vol 78, No 2, p 272-277. 1970. English summary.
Identifiers: Absorption, Environment, Nutrients, Air pollution, Processes, *Soil types, Weathering, Norway, *Path of pollutants, Water pollution.

A review is given of the different soil types in Norway. The nutrient contents as well as the weathering processes in these soils are treated with respect to the influence of airborne contaminations. The ability of these soils to absorb and make use of waterborne contaminations is also discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-03852

BACTERIAL DEGRADATION OF NITRILOTRIACETIC ACID (NTA),
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
D. D. Focht, and H. A. Joseph.
Can J Microbiol. Vol 17, No 12, p 1553-1556. 1971. Illus.
Identifiers: Amino, *Bacterial degradation, Glycine, Sarcosine, *Nitrilotriacetic acid, *Pseudomonas supp., Sewage effluent.

Pseudomonas sp. was isolated from sewage effluent by elective culture with nitrilotriacetic acid (NTA) as its sole nitrogen and carbon source for growth. NTA-nitrogen was converted to biomass and ammonium by growing cultures with small quantities of nitrite (less than 1 ppm) being produced. Washed cell suspensions degraded all of theNTA-nitrogen to ammonium before total conversion of the NTA-carbon to CO2 and H2O. Resting cell suspensions grown from NTA oxidized NTA, aminodiacetic acid, and glycine immediately, whereas methylaminodiacetic acid was oxidized only after an adaptive lag period, and sarocosine was not oxidized at all. Oxidation of aminodiacetic acid was always more rapid than NTA. Nitrosamines or other nitroso compounds were not found in culture of resting cell supernatants incubated with NTA.--Copyright 1972, Biological Abstracts, Inc.
W73-03894

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

EVALUATION OF STREAMFLOW FORECASTS FOR RESERVOIR OPERATION,
Nevada Univ., Reno. Center for Water Resources Research.
For primary bibliographic entry see Field 04A.
W73-03268

PLANNING OF OPTIMAL URBAN WATER SUPPLY SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
R. A. Deininger.
Available from the National Technical Information Service as PB-213 980, $3.00 in paper copy, $0.95 in microfiche. Michigan Institute of Water Research Project Completion Report, July 1971, 15 p, 3 fig, 41 ref. OWRR A-041-MICH (1). 14-01-0001-3222.

Descriptors: Water supply, Water distribution (Applied), *Design, *Distribution systems, *Cities, Mathematical studies, *Optimal development plans, *Computer programs.
Identifiers: Optimal layout.

The problem of designing an economically optimal water distribution system was formulated mathematically and it was shown that it can be solved by either linear programming or dynamic programming, provided the layout of the network is given. Computer programs were written which use these algorithms, and were tested on a few

hypothetical networks. The problem of an optimal layout was approached through a heuristic man-machine interaction system whereby a designer can specify the layout on a cathode ray tube and the computer system will evaluate a least cost design. This system was tested on only a few cases, and difficulties in the hardware (terminal) prevented an extensive testing. At the moment, the computer programs must be considered as experimental, and further developmental work will be necessary to make them available to the general practicing engineers.
W73-03399

SACRAMENTO COUNTY WATER RESOURCES PLANNING STUDY.
Montgomery (James M.), Inc., Lafayette, Calif.

California Department of Public Works, Sacramento, February 3, 1972. 72 p, 10 fig, 31 tab, 57 ref.

Descriptors: *Planning, *Water resources development, *California, Forecasting, Water demand, Water supply, Surface waters, Groundwater, Water resources management, Water requirements.
Identifiers: *Sacramento County (Calif).

Sacramento County, California authorized this study in an attempt to meet future water resource demands. It was found that the total estimated developable supplies are about 1,300,000 acre-feet per year while demand in 1990 will be about 1,420,000 acre-feet/year. Although this deficiency of about 120,000 acre-feet is not predicted to occur until 1990, there are several future developments which could aggravate the situation, or create a deficiency even earlier, including: (1) a reduction in the safe groundwater yield, (2) a reduction in a planned diversion of the American River to Folsom South and (3) an increased minimum flow being demanded for the Sacramento-San Joaquin Delta. This study reviewed all existing studies on water resources for Sacramento County and studied the County's general plan along with water resource data and growth predictions. It is estimated that the county will experience a considerable water deficit in years to come. Especially crucial to Sacramento County will be the requirement that minimum flows be maintained in the Lower American River and the Sacramento-San Joaquin Delta. Fifteen basic recommendations for the County of Sacramento are proposed including: (1) purchase of water from the Folsom South Canal, (2) development of surface water supplies to prevent groundwater overdrafts, (3) participation in State water development programs, (4) establishment of water quality monitoring programs, (5) centralization of water resource management programs in the County, (6) development of a groundwater pumping tax, and (7) non-support of wastewater reclamation projects to avoid groundwater contamination. (Poertner)
W73-03634

A COMPREHENSIVE WATER AND RELATED LAND RESOURCES PLAN FOR THE STATE OF MONTANA, A PROGRESS REPORT, JULY 1, 1967 TO DECEMBER 31, 1970.
Montana Water Resources Board, Helena.

Inventory Series, Report Number 12, December 1970. 25 p, 2 fig, 3 tab.

Descriptors: *Montana, *Water resources management, *Planning, *Surveys (Data collection), Water resources, Water demand, Surface waters, Groundwater.
Identifiers: *State Water Plan.

The Montana Water Resources Act of 1967 directed the preparation of an extensive State Water Plan, the progress of which is reported. The urgency of preparing a comprehensive water plan arises from the increasing threats to claim water originating in or flowing through Montana for use in other areas of the nation. Such plans (referred to as interbasin transfer schemes) are growing in number and scale at an imposing rate; and they are not merely planners' ideas but are advanced to the point that several states are now studying methods of financing water diversion. Four phases of the State Water Plan were set up: (1) inventory of supplies and use; (2) estimations and projections of surpluses and deficiencies for each basin and the state to 1980, 2000 and 2020; (3) recommended developments, both long and short term recognizing past developments, present demands and future needs; and (4) implementation of planned developments. Eleven reports have been published in the attempt to meet the goals of the State Water Plan. Five more are to be published soon. Studies are underway to simulate a river basin model, to develop basic criteria and review of the trends and patterns of economic and social development, to develop groundwater and geological studies, to develop land classification and inventory, and to study the feasibility of desalting water supplies in Eastern Montana. Progress in implementing the plan has been slow. (Poertner)
W73-03640

MONTANA WATER RESOURCES AND PLANNING.
Montana Water Resources Board, Helena.

Inventory Series Report Number 4, October 1968. 19 p, 13 fig, 2 tab.

Descriptors: *Montana, *Planning, *Water resources management, Water resources, Water demand, Land use, Surface waters, Groundwater.
Identifiers: *General review, *State Water Plan.

General information is presented on existing conditions along with a proposed framework for future planning for optimum use. Four sections included are water resources, water use and needs, proposed water framework, and coordination with other plans. Rainfall in Montana varies from less than 6 inches a year to more than 56 inches a year with three-fourths of the state receiving less than 14 inches annually. There are five major drainage basins in the state with runoff averaging 3.5 inches annually, but varying from about 40 inches to less than 0.25 inches. More than 50 per cent of the state, primarily in the east, has less than 1.0 inches of runoff a year. Groundwater withdrawal in 1965 was estimated at 140,000 acre feet and reliable estimates of available water have not been made. Surface water diversion is set at 10.3 million acre-feet, of which 10 million acre-feet was for crop production. (Poertner)
W73-03645

STOCHASTIC POPULATION PROJECTION AT DESIGN LEVEL,
Curran Associates, Inc., Northampton, Mass.
For primary bibliographic entry see Field 05G.
W73-03691

COST-EFFECTIVENESS ANALYSIS OF WASTEWATER REUSES,
Dames and Moorne, Chicago, Ill.
For primary bibliographic entry see Field 05D.
W73-03692

OPTIMAL DESIGN OF URBAN WASTEWATER COLLECTION NETWORKS,
Duke Univ., Durham, N.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-03693

OPTIMAL DESIGN OF WASTEWATER TREATMENT SYSTEMS BY ENUMERATION,
Stanford Univ., Calif. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05D.
W73-03694

SOME EXPERIENCE ON THE USE OF THE GEOPHYSICAL METHODS WHEN CONDUCTING RECLAMATION STUDIES,
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
N. N. Sharapanov, G. Y. Chernyak, and S. K. Makagonova.
International Commission of Irrigation and Drainage Bulletin, p 35-40, July 1971. 1 tab, 4 fig.

Descriptors: *Geological surveys, Investigations, Geophysics, *Land reclamation.
Identifiers: *Reclamation studies, *Geophysical methods, *USSR.

Geophysical methods can help in providing quantitative evaluation of a series of figures necessary when preparing special engineering and geological maps aimed at reclamation development of arid lands. Experience obtained in the Chu River valley and other regions (particularly in the Dnepropetrovsk district of the Ukrainian SSR) has shown that the maximum positive effect is achieved when different geophysical investigation methods are combined, i.e., vertical electrical sounding by direct current (VES) and vertical electrical sounding by excited potentials (VES EP) and seismic prospecting by refracted waves with impact excitation of elastic vibrations. This complex should be closely connected with landscape studies over the entire area under survey and should be accompanied by the common engineering-geological and hydrogeological studies that envisage carrying out the mining and drilling works at a thinner scheme. (Skogerboe-Colorado State)
W73-03798

6B. Evaluation Process

A USER-ORIENTED WATER RESEARCH PLAN FOR NEBRASKA,
Nebraska Univ., Lincoln. Water Resources Research Inst.
W. Viessman, Jr.
Available from the National Technical Information Service as PB-213 800, $3.00 in paper copy, $0.95 in microfiche. Publication No 8, April 1972. 54 p. OWRR A-999-NEB (8), 14-31-0001-3527.

Descriptors: *Research and Development, Water resources development, *Planning, Water policy, *Nebraska.
Identifiers: *Technology transfer, Producer-User Interface.

A user-oriented research plan for Nebraska is presented. Its principal components are: (1) a mechanism for identifying social goals and translating them into research objectives; (2) procedures for setting priorities; (3) a program planning technique for designing projects to impact on important research objectives; (4) a mechanism for coordinating research activities of important research producers; (5) a structure for encouraging and establishing interdisciplinary team efforts when they are required; (6) a well-coordinated technology transfer plan; and (7) an effective method for promoting and sustaining user-researcher cooperation. Implementation of this plan should maximize the effectiveness of the water research input to Nebraska. Application, information transfer and user involvement are stressed.
W73-03267

THE EFFECTS OF AUTHORIZATION FOR WATER IMPOUNDMENTS ON SHORELAND TRANSITION,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
S. F. Weiss, R. J. Burby, and T. G. Donnelly.
Available from the National Technical Information Service as PB-213 814, $3.00 in paper copy, $0.95 in microfiche. Completion Report, July 26, 1972. 15 p, 10 tab. OWRR B-047-NC (1), 14-31-0001-3625.

Descriptors: *Planning, *Land development, *North Carolina, *Reservoirs, *Impoundments, Urbanization, Model studies, *Land use.
Identifiers: *New Hope Reservoir (NC), *Falls Reservoir (NC).

Private capture of social benefits created by reservoir construction threatens ability of public agencies to efficiently provide land and facilities to meet projected demands for water-oriented recreation. Objectives of this research are: (1) identify and evaluate factors which explain the location of land transactions, changes in land prices or value, and changes in land use patterns which occur after the authorization of water impoundments; (2) develop and test a model to predict short-term changes in land ownership, land value, and land utilization; (3) develop a system for monitoring changes in land values, land use, and predictive factors utilized in the transition model as they occur in reservoir areas; and (4) prepare policy guides to enable the Corps of Engineers and state and local governmental agencies to prevent the exploitation of land in authorized reservoir areas and to facilitate desirable development to meet public land use objectives. Major accomplishments during FY 1972 were: (1) completion of interviews with random sample of landowners who purchased property in the reservoir study areas after authorization by Congress; (2) formulation and tests of computer program for isolating key factors associated with landowner decisions to hold or sell property after reservoir authorization and factors associated with variation in sales prices; and (3) calculation and coding of property characteristics associated with complete inventory of the transactional history of 6, 545 parcels in the reservoir study areas.
W73-03269

CULTURAL BENEFITS FROM METROPOLITAN RIVER RECREATION - SAN ANTONIO PROTOTYPE,
Texas A and M Univ., College Station. Water Resources Inst.
C. A. Gunn, D. J. Reed, and R. E. Couch.
Available from the National Technical Information Service as PB-213 816, $3.00 in paper copy, $0.95 in microfiche. Technical Report 43, September 1972. 116 p, 80 fig, 41 tab, 55 ref. OWRR A-018-TEX (1), 14-31-0001-3244, 14-31-0001-3544.

Descriptors: *Cities, *Recreation facilities, *Social Values, Environment, *Texas, Recreation demand, Recreation, *Water resources development, Landscaping, Social aspects.
Identifiers: *San Antonio, *River Walk, *Paseo Del Rio.

Contrary to the general decay of the core of most American cities, the heart of San Antonio is now a vital cultural and business center. Most of this is due to the development over a period of many years of an attractive and functional pedestrian business-park complex called the River Walk. This water recreational complex was investigated in order to analyze its physical environmental characteristics, its use by visitors, and the attitudes toward it as held by users, owners, and controllers. The results indicate that this relatively small water area (horseshoe bend covering about four by six blocks) is having great impact upon the social and economic life of the community. Not only do visitors enjoy it; the voters show strong interest in expansion even if it would raise taxes. The River Walk demonstrates that a wide diversity of visitors--racial, occupational, income, and age diversity--make use of this cultural asset. A combination of intensive landscape treatment, historical restoration, entertainment, walks, sightseeing boats, and several shops and restaurants is producing a unified tourist and recreational destination area centered about water. The conclusions are useful to planners and civic leaders of any city that has water as a natural resource.
W73-03270

CERTAINTY, COMPLEXITY AND CURIOSITY-- A NOTE ON STUDYING THE HYDROLOGICAL EFFECTS OF LAND MANAGEMENT CHANGES,
Ministry of Works, Wellington (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 04C.
W73-03280

CANYON LAKES PROJECT, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Recreation, Washington, D.C.

Available from the National Technical Information Service as EIS-TX-72-4923-F, $4.75 in paper copy, $0.95 in microfiche. July 19, 1972. 55 p, 1 map.

Descriptors: *Environmental effects, *Texas, *Parks, *Recreation facilities, Recirculated water, Water reuse, Water conservation, Water allocation (Policy), Irrigation water, Recreation, Landscaping, Lakes, Multiple-purpose projects, Land use, Community development, Area redevelopment, Water distribution (Applied), Conveyance structures, Pipelines.
Identifiers: *Environmental Impact Statements, *Canyon Lakes (Tex).

The project involves the acquisition and development of lands within Lubbock, Texas, for public outdoor recreation purposes. Facilities include: 6 lakes totaling 175 acres, picnic shelters, a recreation pavilion, a fishing dock, a water collection system, an irrigation system and many other park related facilities. The project will provide recreation opportunities for local residents and enhance the overall environment of the community. The water in the park will be recycled and used for irrigation purposes and maintenance of proper lake water levels. The project is also expected to stop the trend in the surrounding neighborhood from residential to a mixture of wrecking yards, asphalt plants, and scrap metal businesses. Principal adverse effects will occur with the relocation of people and businesses to new locations. Alternatives considered include no project, line-of-sight acquisition for additional development, enlargement of the project to eight lakes and acquisition of the same lands with minimal recreation development. Comments from interested agencies are included. (Beardsley-Florida)
W73-03575

AMEND WATER RESOURCES PLANNING ACT.
For primary bibliographic entry see Field 06E.
W73-03588

WATERSHED DEVELOPMENT PLANS--1969.

Hearings--Subcomm. on Watershed Development--Comm. on Public Works, U.S. House of Representatives, December 10, 1969. 60 p, 2 append.

Descriptors: *Watershed management, *Project purposes, *Government interrelations, *Application methods, *Comprehensive planning, Decision making, Cost-benefit analysis, Flood control, Erosion, Irrigation, Recreation, Water conservation, Surface waters, Environmental effects, Economic impact, Project benefits, Public rights, State governments, Water resources development, U.S. Water Resources Council.
Identifiers: *Congressional hearings.

This subcommittee recorded testimony and statistical material on approximately thirty watershed projects throughout the Nation. Statements as to added employment, income increases, growth in productivity, economic stability, recreation and tourism, irrigation and agricultural conditions, cost/benefit ratios, flood water prevention, water supply reservoirs, municipal needs, erosion control, forest management and overall planning for economic needs are included. Also recorded are recommendations for changes in current evaluation to include four objective accounts: (1) the National Income Account--most of the benefits currently evaluated fall into this account; (2) the Regional Income Account--the additional economic impacts on regional development objectives; (3) the Environmental Account--including conservation, preservation, creation, or restoration of natural, scenic, and cultural resources in order to enhance or maintain the quality of the environment; and (4) the Well-being Account--including such benefits as security of life and health, national defense, personal income distribution, interregional employment and population distribution. (Tolle-Florida)
W73-03590

AMENDMENTS TO THE COMPACT CREATING THE POTOMAC VALLEY CONSERVANCY DISTRICT AND ESTABLISHING THE INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN.
For primary bibliographic entry see Field 06E.
W73-03591

SABINE RIVER BASIN COMPREHENSIVE STUDY.

Hearing--Subcomm. on Flood Control--Comm. on Public Works, U.S. House of Representatives, February 28, 1969. 118 p, 1 map, 9 tab.

Descriptors: *Texas, *Floods, *Water resources development, *River basin development, Watershed management, Watersheds (Basins), Recreation, Transportation, Conservation, Flood control, Silts, Water supply development, State governments, Navigable rivers, Coastal plains.
Identifiers: *Sabine River Basin, *Congressional hearings.

This hearing concerns relief of flooding problems within a fourteen county area in Texas touched by the Sabine River. Silt and log jams have been contributing factors to flooding over the years. Testimony and reports produced the position that the population explosion expected by the end of the century dictated the protection and development of this potentially economically productive watershed area. The need for conservation, flood control and land reclamation so as to prepare for needed hydroelectric power, municipal water supplies, recreation facilities and barge transportation were cited in the comprehensive study by the Corps of Engineers included in the record. Total development was the position the private citizens in the area emphasized. (Tolle-Florida)
W73-03593

CONCEPT FOR LONG RANGE, REGIONAL ENVIRONMENTAL PLANNING FOR POPULATION ABSORPTION THROUGH REGIONAL WATER MANAGEMENT,
Smith (Lewis Gordy), Denver, Colo.
L. G. Smith.
Presented at the American Water Works Association Annual Conference, Denver, Colorado, June 17, 1971. 13 p, 2 fig.

Descriptors: *Planning, *Water resources, *Water resources development, *Population growth, *Environmental engineering, Forecasting, Land use, Environmental effects, Ecology, River basin development, Water supply, Water supply development, Regional analysis, Long term planning.
Identifiers: *Regional planning.

The recent attitude of zero population growth in areas across the United States, while justified, its not realistic for the nation as a whole. The population of the United States is expected to grow by 70 to 100 million by the year 2,000. This added growth will require the growth of many cities, but this growth should not result in the total destruction of a high-quality urban environment. The growth should be accomplished with regard for nature and for providing for the type of life that people want to live. Planning for this growth is essential and should be done in two ways-the creation of new towns, and the vertical, and not horizontal, expansion of our present cities. The prospect of new towns is especially favorable for areas in the South Atlantic and Gulf Coastal Plains areas because water supplies are plentiful, the climate is mild and natural resources are available. By properly treating wastewater, stream quality need not suffer; and, by planning towns with the thought of their eventual destruction, reuse of waste materials can be designed for. Nature preserves would be set aside and new sources of energy would have to be part of a regional plan. Steps towards implementation are many and would require interdisciplinary studies by either single states or interstate regions. (Poertner)
W73-03638

KOHAKOHAU DAM ENGINEERING FEASIBILITY.
Parsons Brinckerhoff-Hirota Associates, Honolulu, Hawaii.
For primary bibliographic entry see Field 08A.
W73-03642

A STUDY OF UTILITIES IN THE TOLEDO REGIONAL AREA.
Finkbeiner, Pettis and Strout Ltd., Toledo, Ohio.
For primary bibliographic entry see Field 06D.
W73-03651

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

WATER SERVICE PRICES: A PRINCIPAL COMPONENT AND REGRESSION ANALYSIS OF DETERMINANTS,
West Virginia Univ., Morgantown, W. Va. Regional Research Inst.
P. C. Mann.
Available from the National Technical Information Service as PB-213 808, $3.00 in paper copy, $0.95 in microfiche. Report, July 1972, 61 p, 19 tab, 44 ref. OWRR C-2012 (No 5394) (1).

Descriptors: *Water Rates, *Water Costs, *Municipal Water, *Utilities, *Pricing, Public Utilities, Rates, Resource Allocation, Political Aspects, Taxes, Regulation, Urbanization, Average Prices, Local Governments, Government Finance.
Identifiers: *Rate Structures, *Metered Rates, Utility Profits, Debt Costs, Operation Costs, Utility Taxes, Load Factors.

To identify factors associated with water prices, 1960 data for 400 water utilities were collected on 12 measures of rates and rate structures as well as 28 independent factors or potential determinants. The variables were subjected to correlation, principal component, and regression analysis to ascertain the interrelationships among both price and independent variables and to determine the factors significantly linked with price variations across utilities. A regression model was constructed incorporating 8 independent factors theoretically associated with water prices. The regression results indicated that both metered rates and average rates were significantly influenced by cost or cost-related variables. Furthermore, there was evidence of a strong linkage between publicly-owned utilities and the municipalities they serve. The linkage was evidenced by a strong negative relationship between municipal water prices and municipal taxes. This analysis of water prices indicated the extent to which prices in the United States are related to utility costs and the degree to which prices are influenced by non-cost factors.
W73-03256

WATER RESOURCES RESEARCH ACT--AMENDMENTS (LEGISLATIVE HISTORY).
For primary bibliographic entry see Field 06E.
W73-03339

APPROPRIATIONS AUTHORIZATIONS--WATER RESOURCES (LEGISLATIVE HISTORY).
For primary bibliographic entry see Field 06E.
W73-03340

RIVER BASIN MONETARY AUTHORIZATION ACT OF 1971.
For primary bibliographic entry see Field 06E.
W73-03341

RESOURCE CONSERVATION AND DEVELOPMENT PROJECTS--FEDERAL ASSISTANCE.
For primary bibliographic entry see Field 06E.
W73-03349

THE COST OF WATER TREATMENT BY COAGULATION, SEDIMENTATION AND RAPID SAND FILTRATION,
Louis Koenig-Research, San Antonio, Tex.
For primary bibliographic entry see Field 05F.
W73-03460

QUALITY AND COST EVALUATION OF TREATMENT PROCESSES FOR A SPECIFIC WATER,
East Bay Municipal Utility District, Oakland, Calif.
For primary bibliographic entry see Field 05F.
W73-03487

CAN STATES PAY MORE,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 05G.
W73-03668

DIGITAL COMPUTER SIMULATION OF WASTEWATER TREATMENT,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W73-03685

6D. Water Demand

SACRAMENTO COUNTY WATER RESOURCES PLANNING STUDY.
Montgomery (James M.), Inc., Lafayette, Calif.
For primary bibliographic entry see Field 06A.
W73-03634

MUNICIPAL WATER SUPPLIES AND USES, NORTHWESTERN NEW MEXICO,
G. A. Dinwiddie, W. A. Mourant, and J. A. Basler.
New Mexico State Engineer, Santa Fe, Technical Report 29C, 1966. 197 p, 24 fig, 25 tab, 2 ref.

Descriptors: *New Mexico, *Municipal water, *Surveys (Data collection), Water resources, Wastewater treatment, Water quality, Water supply systems, Water demand, Water wells, Water utilization, Sewerage, Septic tanks.
Identifiers: *Northwestern New Mexico.

In 1963, the U. S. Geological Survey, in cooperation with the State Engineer of New Mexico, began working on an inventory of the water supplies and systems of communities in northwestern New Mexico. This report is the third volume of a four part series for the State and presents the results for 98 communities of population 100 or more. The data inventoried includes: population, official source of information and date obtained, ownership of supply and system, number and type of customers, cost (to customers) of water and sewerage, source of water, demand for water, per capita use, storage facilities, quality and chemical treatment of water, sewage-disposal facilities, and plans for improvement of the water supply and system. Most communities have adequate water supplies and distribution systems along with sewage disposal systems. The per capita consumption of water ranges from about 5 gpd to about 350 gpd. Generally, the water is very hard, but still acceptable. (Poertner)
W73-03641

EVALUATION OF GROUND-WATER RESOURCES AND LONG-TERM WATER DEVELOPMENT, PARADISE VALLEY, ARIZONA,
Water Development Corp., Tucson, Ariz.
For primary bibliographic entry see Field 04B.
W73-03643

A STUDY OF UTILITIES IN THE TOLEDO REGIONAL AREA.
Finkbeiner, Pettis and Strout Ltd., Toledo, Ohio.

Toledo Regional Area Plan For Action, Toledo, Ohio, March 1968. 150 p, 27 fig, 35 tab.

Descriptors: *Utilities, *Regional analysis, *Data collections, *Planning, Waterworks, Sewage treatment plants, Water resources management, Water pollution control, Water supply systems, Sewerage, Ohio.
Identifiers: *Toledo Regional Plan, *Toledo.

The first step in a long-range, comprehensive land use and transportation planning program is a complete inventory of existing conditions. As part of this inventory for the Toledo Regional Area, utilities are inventoried as they existed in 1966. The chapters on sewage system include (1) existing systems, (2) sewerage systems standards, (3) deficiencies, (4) expansion potential, (5) legal status, (6) sewage flow projections, and (7) financial status. A similar arrangement exists for water utilities. The major deficencies of sewerage systems in the Toledo region is that many are combined sewer systems and many have high rates of infiltration into the system. Also, sewage treatment in the area is generally poor. Some communities offer no treatment at all and many plant capacities are already exceeded. With population growth almost a certainty and percapita sewerage quantities expected to rise, in some cases, by over 50 percent by 1985, these deficiencies will increase in the future unless construction is undertaken. Water supply deficiencies are limited only to the fact that some urban areas have no public supplies. Water consumption on a per capita basis is expected to grow by about 50 percent in some areas and by 10 percent in other areas by 1985, and no problems are foreseen in meeting this future demand. Water is both from surface supplies and groundwater, with smaller municipalities relying more on groundwater. Quality is generally poor for surface waters due to pollution. (Poertner)
W73-03651

6E. Water Law and Institutions

URBAN-METROPOLITAN INSTITUTIONS FOR WATER PLANNING, DEVELOPMENT AND MANAGEMENT: AN ANALYSIS OF USAGES OF THE TERM'INSTITUTIONS,'
Colorado State Univ., Fort Collins. Environmental Resources Center.
N. Wengert.
Available from the National Technical Information Service as PB-213 807, $3.00 in paper copy, $0.95 in microfiche. Colorado Environmental Resources Center, Ft. Collins, Completion Report Series, No 36, September 1972. 88 p, 80 ref.OWRR W-122 (1), 14-31-0001-3183.

Descriptors: *Institutional Constraints, *Institutions, *Social Values, *Urban Sociology, *Water Management (applied), City Planning, Government Interrelations, Local Governments, Municipal Water, Social Change, *Water Resources Institute.
Identifiers: *National Water Commission.

The term 'institution,' and its several variants, are used frequently in the literature of urban-metropolitan water management. This review of various usages in social science literature, in government reports and studies (including separate chapters on National Water Commission studies and in State Water Center reports, the latter based on specific responses to letter of inquiry), concludes that the term was often used as a kind of 'black box' to account for, but not explain, behavioral, societal, or managerial factors. In other cases, especially in federal reports, it was used simply as a synonym for 'organization' in its narrowest sense of administrative structure. Among the social sciences, sociology has been most concerned with giving meaning to the term. Borrowing from that field, an institution is defined as 'the structured result or outcome of a process by which values are articulated, arranged and communicated, having continuity over time, with the effect of influencing or controlling the behavior of persons involved with it who did not necessarily participate in formulating those values (norms).' The review concludes that equating institutions with organization is most unfortunate, obscuring some of the rich behavioral dimensions of social analysis, and pleads for more discriminating use of the concept. (See also W73-03254 and W73-0255)
W73-03253

SEARCHING THE SOCIAL SCIENCE LITERATURE ON WATER: A GUIDE TO SELECTED INFORMATION STORAGE AND RETRIEVAL SYSTEMS PRELIMINARY VERSION,
Colorado State Univ., Fort Collins. Environmental Resources Center.
F. Hogge, and N. Wengert.
Available from the National Technical Information Service as PB-213 874, $3.00 in paper copy, $0.95 in microfiche. Colorado Environmental Resources Center, Ft. Collins, Completion Report Series, No 37, September 1972. 45 p. OWRR W-122 (2), 14-31-0001-3183.

Descriptors: *Bibliographies, *Indexing, *Information Retrieval, *Publications, City Planning, Data Collections, Governments, *Institutions, Local Governments, Management, Social Change, Urban Sociology, Water Management (applied).
Identifiers: *Social Science Literature, *Water resources literature.

This guide was prepared in connection with a state-of-the-art survey and literature review on 'Institutions for urban-metropolitan water planning, development and management.' Although there is a growing recognition that institutions and institutional arrangements are important, it became apparent that there was no commonly accepted definition of the concept 'institution,' and that the search for relevant literature would need to be much broader than initially anticipated. In this connection then, it seemed useful to explore and utilize a wide range of information storage and retrieval systems. In the process of this explorations, this guide was produced as a convenient way of describing the several systems utilized. The guide has three objectives: to review developments in information storage and retrieval; (b) to indicate progress being made in developing systems; and (c) to describe available systems which might be of use to investigations into the social science aspects of water. Separate chapters deal respectively with 'general' systems, with discipline oriented systems, and with certain basic bibliographic and other search resources. The guide is titled a 'Preliminary Version' in the expectation that comments and suggestions from users may result in its improvement. (See also W73-03253 and W73-03255)
W73-03254

INSTITUTIONS FOR URBAN-METROPOLITAN WATER MANAGEMENT: ESSAYS IN SOCIAL THEORY,
Colorado State Univ., Fort Collins. Environmental Resources Center.
N. Wegert, E. Knop, W. K. Warner, R. J. Mowitz, and E. R. Kaynor.
Available from the National Technical Information Service as PB-213 829, $3.00 in paper copy, $0.95 in microfiche. Completion Report Series, No 39, November 1972. 93 p. OWRR W-122 (3), 14-31-0001-3183.
Identifiers: *Social Theory, *Institutional Effectiveness, Geographic Factors-Institutions, Great Lakes Institutions.

This volume of essays is a part of a state-of-the-art review and literature survey on the topic: 'Institutions for urban-metropolitan water planning, development and management.' Because the literature on the subject was confusing and contradictory, it seemed that a set of essays written by scholars from different disciplines would contribute useful insights and might help structuring the subject. The scope of treatment is suggested by the essay titles: 'Social Institutions: A Conceptual, Contextual, and Case Analysis' (Knop); 'Institutional Effectiveness and Accountability in Water-Resources Management' (Warner); 'Institutions and Urban Water Management -- A Public Administration Perspective' (Mowitz); 'Measurement of the Institutionalization Process in Urban-Metropolitan Water Supply and Waste Water-Treatment Programs' (Kaynor); 'Institutions and Urban Water Management' (Hufschmidt); 'Some Problems of Institutional Analysis' (Ostrom); 'Geographic Factors in the Design of Urban Water Management Institutions' (Zobler); 'Institutions and Urban Water Management: A Systems View' (Bulkley). In addition, the appendix contains condensations of 'Institutions for Managing Lakes and Bays,' and 'Institutional Arrangements for the Great Lakes,' both by Craine. (See also W73-03253 and W73-03254)
W73-03255

WATER QUALITY MANAGEMENT DECISIONS IN COLORADO,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W73-03261

CONJUNCTIVE USE OF GROUND AND SURFACE WATERS,
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 04B.
W73-03266

LEGAL ASPECTS OF WATER POLLUTION IN NEW JERSEY AND PENNSYLVANIA: A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05G.
W73-03276

COMMENTS ON WATER LAWS IN MINNESOTA,
Minnesota Univ., St. Paul. Water Resources Research Center.
R. A. Haik.
Ground Water, Vol 8, No 4, p 4-10, 1970. 2 ref.

Descriptors: *Minnesota, *Legal aspects, *Legislation, *Water resource development, Administrative agencies, Judicial decisions, Local governments, Federal-state water rights conflicts, Riparian rights, Water permits, Water transfer, Water law, Regulation, Governments, Administration.

Specific aspects of water and related land resource law in Minnesota are analyzed and discussed. The analysis is based upon pertinent state and federal legislation, court decisions, and municipal ordinances relating to water resources. Citations are omitted. The state of existing law, the adequacy of such law, and suggested judicial and legislative alternatives are presented. The following subject areas are analyzed: (1) state administration of water resources, (2) water resource policies, (3) adequacy of existing riparian rights doctrine, (4) adequacy of legislation regulating water permits, (5) scientific and legal classifications of water, (6) conflicts of federal-state water jurisdiction, and (7) constraints on development of water resources. (Earl-Florida)
W73-03311

SCHWENGEL--A SOIL CONSERVATION LEADER,
House, Washington, D.C.
W. H. Harsha.
Congressional Record, Vol 118, p E8175-E8176 (daily ed.) September 27, 1972. 2 p.

Descriptors: *Water pollution control, *Legislation, *Water pollution sources, *Erosion control, Watershed (Basins), Erosion, Federal government, Natural resources, Water resources, Sediment control, Soil conservation, Sedimentation, Administrative agencies, Federal budget, Economics.
Identifiers: *Non-point source pollution, *Restoration.

An analysis of the Schwengel-Kee nonpoint source water pollution bill by the National Association of Conservation Districts (NACD) is discussed. The NACD stresses that sediment-laden run-off and soil erosion impair water quality. The Schwengel-Kee bill would authorize technical assistance, cost-sharing, and 10-year agreements, which would provide for a head-on attack against roadside and streambank erosion, the restoration and rehabilitation of non-federal lands damaged by strip mining, and the protection of 'rapidly developing rural and urban areas' as well as farms and ranches against excessive erosion and outpourings of sediments. Special attention is given to the sediments arising from poultry and livestock operations. Testimony from executive agencies noted the severity of the sediment problem, but backed away from recommending enactment of the bill because of budgetary considerations. Speaking on behalf of the NACD, Director Richard Longmire of Oklahoma declared 'the bill now being considered by the committee expands and improves upon all the points urged by the NACD'. (Tolle-Florida)
W73-03312

LAKE TAHOE AND FRAGILE ENVIRONMENT,
House, Washington, D.C.
H. T. Johnson.
Congressional Record, Vol 118, p E8165-E8166 (daily ed.) September 27, 1972. 2 p.

Descriptors: *Water quality control, *Watershed management, *Wastewater (Pollution), *Sewage treatment, Water control, Sanitary engineering, Federal government, Administrative agencies, Cost allocation, Nutrients, Eutrophication, Land fills, Federal Water Pollution Control Act, Erosion, Sewerage, Water pollution control.
Identifiers: *Lake Tahoe (Nevada and California).

The fragile ecosystem of the Lake Tahoe area basin is discussed and the statement of Mr. Paul De Falco, Jr., Regional Administrator (IX) of the Environmental Protection Agency, made before a Senate Public Works Sub-committee is introduced. The presentation summarizes the work done to preserve the environment surrounding the lake in relationship to pressures of development. Particular points discussed are: efforts to protect the quality of the waters of Lake Tahoe by implementation of a system of sewage and solid waste export; the possible effects on water quality due to the cycle of land alteration, erosion, sedimentation, transport of nutrients, and eutrophication; the air pollution control program; the activities of EPA, other federal agencies, and the Tahoe Regional Planning Agency in protecting the basin's environmental quality. The interrelatedness of these problems is nowhere more evident than in the Tahoe Basin. DeFalco states that the fragile ecological system which is Tahoe demands not just water pollution control or air pollution control, but a true environmental review, and coordinated efforts by state and local jurisdictions, with the cooperation of the federal government. (Tolle-Florida)
W73-03313

SAFE DRINKING WATER ACT OF 1972 (S. 3994).

Congressional Record, Vol 118, p S16258-S16270 (daily ed.) Sept. 28, 1972. 13 p.

Descriptors: *Legislation, *Potable water, *Water quality standards, *Public health, *Water quality control, Water pollution control, Law enforcement, Governments, Wastes Administrative agencies, Water policy, Federal government, State governments, Standards, Water law, Water supply, Water demand, Water quality, Water purification.
Identifiers: *Safe Drinking Water Act of 1972, Environmental Protection Agency, Standing (Legal).

This Act provides that the Administrator of the Environmental Protection Agency (EPA) shall issue regulations prescribing national drinking water standards. The states will bear the primary responsibility of enforcing these standards. If the Administrator finds that his responsibility has not been met, he, or upon his request the Attorney General, may commence an action against the offending party. Alternatively, the Administrator may issue an order to the offending party to rectify the situation. The Administrator shall give public notice of failure to comply with the standards. The Act provides for the establishment of a National Drinking Water Council, composed of scientifically qualified members, within the EPA. The Administrator shall also conduct and promote research in water contaminant-related diseases. He shall arrange for a survey of the quantity, quality and availability of rural drinking water supplies. Specified sums of money are authorized for approriation to the states to assist them in establishing and maintaining adequate programs to assure the safety of public drinking water. The Act allows any person to commence a civil action, on his own behalf, for injunctive relief against certain parties and within specified limitations. (Reed-Florida)
W73-03314

CONFERENCE REPORT ON H.R. 9727, MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT OF 1972.

Congressional Record, Vol 118, p H9904-H9908 (daily ed.) Oct. 13, 1972. 5 p.

Descriptors: *Legislation, *United States, *Waste dumps, *Waste disposal, *Oceans, Water pollution sources, Water pollution effects, Water pollution control, Pollution abatement, Sewage disposal, Permits, Penalties (Legal), Water law, Legal aspects, Research and development, Administrative agencies, Aquatic environment, Radioactive wastes, Chemical wastes, Municipal wastes, Industrial wastes.
Identifiers: *Coastal waters, *Contiguous zone, *Marine protection, Research and Sanctuaries Act of 1972.

The oceans have become dumping grounds for garbage, sewage sludge, contaminated dredge spoils, industrial wastes and radioactive wastes. One example of what this can lead to is the New York Bight, an 'ocean desert' where plants and animals have been killed by toxic wastes. To regulate this situation the House passed the conference report on the Marine Protection, Research and Sanctuaries Act of 1972. Various provisions of the Act are discussed including the permit program, permit procedures, prohibited disposals, the Marine Sanctuaries sections, and penalties. Differences between the Senate and House Bill and the resolution of these differences are also discussed. The principal difference concerned the permitting of dredged spoil disposal, which makes up eighty per cent of all waste materials dumped in the ocean. The House version, authorizing the Corps of Engineers rather than the Environmental Protection Agency to permit the dumping of dredged spoil, was accepted. Another difference was in the application of the Act to inland waters. The Conference Committee adopted the Senate version and did not apply the Act to inland waters. (Brackins-Florida)
W73-03315

CONFERENCE REPORT ON H.R. 9727, RESTRICTION ON DUMPING OF MATERIAL IN OCEANS, COASTAL AND OTHER WATERS.

Congressional Record, Vol 118, p H9339-H9344 (daily ed.) October 9, 1972. 6 p.

Descriptors: *United States, *Legislation, *Waste dumps, *Waste disposal, *Oceans, Pollution abatement, Permits, Water pollution, Water pollution control, Water quality control, Water law, Legal aspects, Administrative agencies, Law enforcement, Penalties (Legal), Research and development, Radioactive waste disposal, Chemical wastes, Biological warfare.
Identifiers: *Coastal waters, Dredged spoil disposal, Citizen suits.

Title I of the Marine Protection, Research and Sanctuaries Act of 1972 prohibits ocean dumping without a permit and prohibits all dumping of radiological, chemical and biological warfare agents and high-level radioactive waste. The Environmental Protection Agency, (EPA), is charged with the issuance of permits for disposal of all materials except dredged spoils, which are covered by Corps of Engineers' permits. The permit requirements are in force for all waters of the open seas lying seaward of the baseline from which the territorial sea is measured. Provisions are included allowing the EPA to charge permit fees. Civil penalties are limited to $50,000 per violation. Criminal penalties for those who 'knowingly' violate the Act are limited to $50,000 and one year in prison. Citizen's suit provisions allow private persons to sue to enjoin violations of the Act. Title II, Comprehensive Research on Ocean Dumping, provides for monitoring and research on the long range effects of ocean dumping on the ocean eco-system. Title III provides for the establishment of Marine Sanctuaries, special conservation areas which can be established in all tidal waters, even within the territorial limits of a state. Included is a joint explanatory statement of the conference committee. (Brackins-Florida)
W73-03316

CONFERENCE REPORT ON S.2770, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENT OF 1972.

Congressional Record, Vol 118, p H9114-H9135 (daily ed.) Oct. 4, 1972. 22 p, 3 tab.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Federal supports, *Permits, *Waste disposal, Water pollution control, Pollution abatement, Government finance, Federal budget, Treatment facilities, Waste treatment, Cost sharing, Budgeting, Watercourses (Legal aspects), Water law, Legal aspects, Judicial decisions, Thermal pollution, Law enforcement, Penalties (Legal), Grants, Water quality standards, Effluents, Sewage disposal.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Citizen suits, National Environmental Policy Act, Refuse Act of 1899, Standing (Legal).

The Conference Report on the Federal Water Pollution Control Act Amendments of 1972 contains a summary of the major substantive provisions of the Act. Also included is discussion of various provisions of the Act. Primary consideration was given to the allocation of federal money for construction of waste treatment facilities, including the method of allocation, determination of the federal share and the flexibility accorded to the executive branch in making the allocations. Another focal point of discussion was the permit program, the inadequacy of the current program, the application procedures and provisions for a state permit program. The two phase program for effluent limitation and the relationship of the National Environmental Policy Act to the instant act are also discussed in detail. The remarks also cover section 316 and thermal discharges, effect of the legislation on pending litigation, relationship of water quality standards and effluent limitations, definitions of citizens' suits and navigable waters within the scope of the legislation, and liability for discharge of oil and hazardous substances. (Brackins-Florida)
W73-03317

PACIFIC NORTHWEST RIVER BASINS COMMISSION, ANNUAL REPORT, FISCAL 1971.
Water Resources Council, Washington, D.C.

Available from the National Technical Information Service as PB-209 170, $3.00 in paper copy, $0.95 in microfiche. June 1971. 44 p, 1 map, 8 photo, 1 tab.

Descriptors: *Pacific Northwest U.S., *Water resources development, *River basin development, Federal government, Water supply, Water requirements, Regional development, Optimum development plans, Interstate commissions, Conservation, Resources, Water supply development, Water utilization, Comprehensive planning, Planning, Non-structural alternatives, Alternate planning, Water resources.
Identifiers: *Pacific Northwest River Basins Commission.

The Commission has adopted a recommendation to proceed immediately to prepare a comprehensive plan to solve the Pacific Northwest's future water needs while abandoning their subregional study concept. This new planning direction will accomplish objectives with which the Commission is

charged by Congress and at the same time have the plan incorporated into the 11-state western United States water plan. It will additionally provide major components for water resources plans for the states within the basin. The study deadline is 1977. The plan consists of coordination of management, development, preservation and use of the region's water and related land resources, plus a system of structural and non-structural measures and programs designed to meet early needs and long range needs where practicable. The joint plan will be based on the recently completed North Pacific Framework Study. Other studies discussed are as follows: Willamette and Puget Sound studies, Ross Lake study, Wild and Scenic Rivers studies, and state water resource studies (Idaho, Montana, Oregon, Washington, Wyoming). Reports of various federal departments which have actively supported the Commission during the past year are included. (Beardsley-Florida)
W73-03318

WATER LAW IN ALABAMA--A COMPARATIVE SURVEY,
Alabama Univ., University School of Law.
H. Cohen.
Alabama Law Review, Vol 24, p 453-489, 1972. 218 ref.

Descriptors: *Alabama, *Judicial decisions, *Water law, *Water utilization, Riparian rights, Reasonable use, Watercourses (Legal aspects), Legal aspects, Consumptive use, Non-consumptive use, Common law, Prior appropriation, Natural flow doctrine, Navigable waters, Ownership of beds, Civil law, Groundwater, Surface waters, Groundwater availability, Surface water availability, Surface runoff, Groundwater mining, Hydrologic cycle, Riparian land.
Identifiers: Public trust doctrine, Common enemy rule, Correlative rights rule.

The state of the law in Alabama with regard to water in surface watercourses, groundwater and diffused surface waters is analyzed. The Alabama courts rejected very early the prior appropriation rule in favor of the reasonable use and riparian rights rules to regulate consumptive uses of surface watercourses. In relationship to non-consumptive uses discussion focuses on the concept of navigability, ownership of the bed under the water and the public trust doctrine. For underground waters the common law rule, the reasonable use rule, the prior appropriation rule and the correlative rights rule are described. Alabama follows the reasonable use rule. The law relating to diffused surface waters is discussed in terms of the common enemy rule, the civil law rule, and the reasonable use rule. Alabama Courts have followed a modified civil law rule, much like the reasonable use rule and a strict civil law rule. A fundamental deficiency in the law is the lack of recognition of the interrelatedness of the hydrologic cycle. The theme running through a great deal of the present law is reasonable use. However it is obvious that the present court-made policies are in need of repair. Wise water decision-making depends on hydrologic and planning expertise. (Brackins-Florida)
W73-03321

STANDING TO BRING ENVIRONMENTAL ACTIONS: QUI TAM AND THE REFUSE ACT OF 1899,
For primary bibliographic entry see Field 05G.
W73-03322

TERRITORIAL JURISDICTION--MASSACHUSETTS JUDICIAL EXTENSION ACT--STATE LEGISLATURE EXTENDS JURISDICTION OF STATE COURTS TO 200 MILES AT SEA,
W. E. Farmer, Jr.
Vanderbilt Journal of Transnational Law, Vol 5, p 490-496, 1972. 50 ref.

Descriptors: *Massachusetts, *Legislation, *International waters, *Constitutional law, *State jurisdiction, Fish conservation, Commercial fishing, Fish management, Water law, Legal aspects, Boundary disputes, Oceans, Federal jurisdiction, Federal-state water rights conflicts, Atlantic Ocean, International commissions, Law of the sea, International law, Judicial decisions, State governments, Marine fisheries.
Identifiers: *Coastal waters, *Contiguous zone.

In order to avert impending disaster to adjacent commercial fisheries Massachusetts enacted legislation extending state jurisdiction over marine fishery resources to a distance of two hundred miles out to sea, or to a point where the water depth reaches one hundred fathoms, whichever is farther. Hoever the legislation is of dubious constitutional validity. Two issues are presented: first whether the statute conflicts with positive federal law, thus violating the Supremacy Clause and secondly whether the statute conflicts with the general body of decisional law relating to improper interference with the federal foreign relations power. It seems clear that the law is unconstitutional; the statute interferes with regulations of the International Commission for the Northwest Atlantic Fisheries, it contravenes a federal law limiting state control of fisheries to territorial waters, freedom of the seas by restricting the freedom to fish beyond the contiguous zone, a federal statute prohibiting state control of marine resources beyond the territorial sea and it is an unconstitutional interference with foreign relations. The balancing of priorities to develop a viable fisheries policy cannot be dominated by local interest. What is needed is international control. (Brackins-Florida)
W73-03323

TERRITORIAL JURISDICTION--MINING THE DEEP SEABED--INTERNATIONAL PROBLEMS AND NATIONAL RESOLUTIONS,
M. R. Von Sternberg.
Vanderbilt Journal of Transnational Law, Vol 5, p 497-502, 1972. 29 ref.

Descriptors: *International waters, *Legislation, *International law, *International commissions, Treaties, United States, Law of the sea, Jurisdiction, Governments, Legal aspects, Water law, Oceans, Mining, Water resources development, Ownership of beds, Beds under water, Continental margin, Continental shelf, United Nations.
Identifiers: *Coastal waters, *Seedbeds, Contiguous zone.

The tendency of coastal nations to favor extended national maritime jurisdiction has created a serious conflict between the traditional concepts of freedom of the seas and sovereign territorial rights. The proposed Deep Seabed Act, S2801 (1971), would implement and revise the 1970 Draft Convention on the international seabed which was submitted to the United Nations by the United States. Included in this comment is a discussion of the Draft Convention provisions and the Deep Seabed Act. The Act allows the Secretary of the Interior to grant licenses to citizens or corporations of the United States to mine the seabed. The rights and liabilities attendant with a license, its international ramifications and other provisions are described. The Act appears to be much more acceptable to the international community than its counterpart the Draft Convention. While unilateral action is unacceptable, any rule of international law that is developed must take into account the sovereign state's traditional demands. The proposed Act more clearly recognizes these conflicting demands than does the Draft Convention. (Brackins-Florida)
W73-03324

THE THREE-MILE LIMIT: ITS JURIDICAL STATUS.
Valparaiso University Law Review, Vol 6, p 170-184, 1972. 77 ref.

Descriptors: *Law of the sea, *International law, *Jurisdiction, *Boundary disputes, *International waters, International commissions, Governments, United Nations, Oceans, Legal aspects, Foreign waters, Water rights, Water law, Boundaries (Property), Submerged Lands Act.
Identifiers: *Coastal waters.

Today, no unanimity exists as to the extent of a coastal state's exclusive jurisdiction over the adjacent sea; the law has failed to provide a definitive answer regarding the correct breadth of the territorial sea. When the process of codification has failed to establish a rule of law, such a rule must be found in the customs and usages of the states. The three-mile limit rule is analyzed, its European origins and history discussed and its acceptance and history in the United States are described. The Truman Proclamation and the Submerged Lands Act are also discussed in relation to the rule. International efforts to codify territorial sea limits are also discussed with reference to the Hague Codification Conference of 1930, the United Nations International Law Commission and the Geneva Conference on the Law of the Sea of 1958. The present state of the law is analyzed revealing that a definite trend is in existence away from the three-mile limit toward acceptance of a twelve-mile limit rule. It is clear that the breadth of the territorial sea, on the basis of custom and usage, is gradually widening. The United States must abandon its defense of the sanctity of the three-mile rule and accept the twelve mile limit as its own. (Brackins-Florida)
W73-03325

MARSHLAND TITLE DILEMMA: A TIDAL PHENOMENON,
A. A. Perro, Jr., and L. S. Teleky.
Seton Hall Law Review, Vol 3, p 323-348, 1972. 63 ref, 2 fig.

Descriptors: *High water mark, *New Jersey, *Tidal marshes, *Boundary disputes, Wetlands, Boundaries (Property), Legal aspects, Judicial decisions, Coastal marshes, Marshes, Low water mark, State governments, Ownership of beds, Administrative agencies, Estuaries.

Throughout the sixties New Jersey has engaged in combat with thousands of recorded and previously recognized titles by the sweeping application of an old English doctrine which gave the king the right of way to all navigable streams and waterways and the adjacent land flowed by their tides. The difficulties inherent in the application of this tidelands doctrine such as determining the high water mark, the effect of artificial changes such as dredging on the mark, and the burden of proof are discussed. These complex legal problems and a sizeable backlog of cases pose a crucial problem for New Jersey's judicial system. To alleviate this problem it is proposed that four commissioners be appointed to handle four separate coastal and estuarine regions of the state. Next, the wetlands areas will be categorized as: (1) state owned--those which are clearly state owned; (2) privately owned--those which are clearly privately owned; or (3) controversial--those which can be classified either way. For the controversial lands a factor percentage system will be developed to provide an equitable settlement. This system would provide for an expeditious, uniform administrative clearance of title and payment of compensation and would overcome the virtually impossible problem of proof. (Brackins-Florida)
W73-03326

CURRENT EMISSION STANDARDS, REFINING, AND THE PETROLEUM INDUSTRY,
For primary bibliographic entry see Field 05G.
W73-03327

VIRGINIA AND THE MARGINAL SEA: AN EXAMPLE OF HISTORY IN THE LAW,
D. H. Flaherty.
Virginia Law Review, Vol 58, p 694-725, 1972. 169 ref.

Descriptors: *Virginia, *Ownership of beds, *Boundary disputes, *Beds under water, Submerged Lands Act, Judicial decisions, Federal government, Boundaries (Property), Legal aspects, Water rights, Common law, State jurisdiction, Federal jurisdiction, Water law, Continental shelf, Legislation.
Identifiers: *Contiguous zone, *Coastal waters, Public trust doctrine.

Currently pending before the Supreme Court is United States V. Maine, in which the federal government asserts that it, rather than the states, owns the marginal sea beyond the three mile limit. The claim of Virginia, one of the defendant states is traced. Virginia's claim of ownership to the marginal sea is derived from the Royal Charter of 1609 that gave the Virginia Company ownership of the sea, seabed and mineral resources to one hundred miles from the mainland. During the Colonial period the northern, western and southern boundaries of Virginia were changed. Despite transfers and grants such as the Arlington-Culpepper Grant the old Charters were still regarded as defining the ownership of the marginal sea. On several occasions the Charter of 1609 was relied on as authority for Virginia's borders; for example, the United States recognized it by requiring a formal cession of Virginia's northwestern territory. Discussion of the Treaty of Paris, the Articles of Confederation and the Federal Constitution indicate these documents had no effect on Virginia's claim. Thus, at no point has Virginia's chain of title to the marginal sea been broken. (Brackins-Florida)
W73-03328

NEW ZEALAND'S COASTAL JURISDICTION,
McGill Univ., Montreal (Quebec).
W. F. Foster.
California Western International Law Journal, Vol 1, p 13-32, 1970. 59 ref.

Descriptors: *International law, *Law of the sea, *International waters, *Jurisdiction, International commissions, Continental shelf, Coasts, Legislation, Legal aspects, Commercial fishing, Governments, Water rights, Ownership of beds, Oceans, Water law.
Identifiers: *New Zealand, *Coastal waters, *Territorial seas.

Legislation in New Zealand has created four definite regions in the marine areas in and around New Zealand: (1) the internal waters, (2) the territorial sea, (3) a fishing zone and (4) the continental shelf. This legislation includes the Territorial Sea and Fishing Zone Act 1965, the Continental Shelf Act 1964, and the Submarine Cables and Pipeline Protection Act 1966. Problems encountered in delimiting the territorial sea are discussed, including deforming its breadth, establishing a baseline and measuring the territorial sea; the agreement on fisheries between New Zealand and Japan; and New Zealand's exercise of jurisdiction over these marine areas. New Zealand has established a three-mile territorial sea with a nine-mile fishing zone contiguous to it. Furthermore, the Continental Shelf Act vests in the crown all of the 'sovereign rights' over the continental shelf reserved by the Convention on the Continental Shelf to the coastal state. These enactments do much to codify into the national law of New Zealand existing rules of international law relating to matters which are not entirely the subject of national control or regulation. (Brackins-Florida)
W73-03329

AN OVERVIEW OF INTERNATIONAL ENVIRONMENTAL REGULATION,
Toledo Univ., Ohio. Coll. of Law.
For primary bibliographic entry see Field 06G.
W73-03330

TOWARD A WORLD ORDER RESPECTFUL OF THE GLOBAL ECOSYSTEM,
Princeton Univ., N.J. Center of International Studies.
For primary bibliographic entry see Field 06G.
W73-03331

THE RIVERS AND HARBORS ACT OF 1899--A NEW REMEDY FOR ILLEGAL DREDGE AND FILL OPERATIONS,
For primary bibliographic entry see Field 05G.
W73-03332

BD. OF COMM'RS. OF THE PORT OF NEW ORLEANS V. GYPSUM TRANSPORTATION, LTD. (HAZARDS TO NAVIGATION AND THE RIVERS AND HARBORS ACT OF 1899).

263 So.2d 385-391 (La. Ct. App. 1972).

Descriptors: *Judicial decisions, *Rivers and Harbors Act, *Navigation, *Louisiana, Ships, Legislation, Accidents, Port authorities, Negligence, Damages, Bridges, State governments, Federal government, Legal aspects, Water law, Watercources (Legal aspects), Navigable waters.

Plaintiff Dock Board sought recovery of damages sustained by a bridge when struck by defendant shipowner's vessel. Defendant's vessel failed to properly navigate through the bridge passage causing the subsequent collision. Defendant contended that since plaintiff failed to obtain a permit for construction of the bridge, as required by the Rivers and Harbors Appropriation Act of 1899, the structure constituted an unlawful obstruction to navigation; that the violation of the statute intended to prevent collisions raised a rebuttable presumption that such constituted fault which contributed to the accident. Affirming judgment for plaintiff, Louisiana court of appeals held that the imposition of statutory fault was not applicable in the instant case for two reasons: (1) the statute here involved is not directly designed to prevent collisions but rather to give the government the power to approve and supervise structures which could constitute a hazard to navigation in navigable waters; and (2) statutory fault is imposed only when the structure is an obstruction in fact, causally related to the collison, here there is no evidence that this particular bridge was an unreasonable obstruction to navigation. (Ellis-Florida)
W73-03333

ROCKAWAY POINT BLVD., QUEENS COUNTY, CITY OF NEW YORK V. ATLANTIC IMPROVEMENT CORP. (OWNERSHIP OF FORESHORE AREA BELOW HIGH WATER MARK).
271 N.E.2d 546-549 (N.Y. Ct. App. 1971).

Descriptors: *New York, *Eminent domain, *Judicial decisons, *Ownership of beds, *Boundary disputes, Legal aspects, Water law, Beds under water, High water mark, Boundaries (Property), Tidal waters, Watercourses (Legal aspects), Shores, Condemnation value, Condemnation, Legislation, Low water mark.
Identifiers: Public trust doctrine, Foreshore.

The city in this condemnation proceeding has appealed from an award to claimant landowner in the lower court. The city contended that it had title to the foreshore area between the mean high tide and mean low tide by virtue of a state statute. Claimant alleged that it had title to the foreshore area because his predecessor in title had been granted the area by the state. The statute under which the city claimed title contained a condition that acquisition of title depended on the city's laying out beach lines. This was not done and the statute had already been repealed. The New York Court of Appeals reversed the reward on other grounds but affirmed the lower court's holding that claimant had title to the foreshore rather than the city. The court ruled that claimant's predecessor in title had been granted the foreshore area by the state prior to enactment of the statute in question and thus under any circumstances the city could not claim title to the foreshore area. (Brackins-Florida)
W73-03334

UNITED STATES V. 222 ACRES OF LAND IN COUNTY OF WORCESTER, MD. (RIGHT OF LANDOWNER TO USE OCEAN BEACH MUST BE REFLECTED IN EMINENT DOMAIN COMPENSATION).

324 F. Supp. 1170-1183 (D. Md. 1971). 14 p.

Descriptors: *United States, *Maryland, *Condemnation, *Eminent domain, *Cost repayment, *Compensation, *Land appraisals, Value, Pricing, Land development, Judicial decisions, National parks, Federal project policy, Cost allocation, Governmental interrelations, Legal aspects, Islands, Market value, Prices, Parity ratios.

This is a condemnation case involving 134 tracts of beach front property on Assateague Island, Maryland and Virginia. The federal government sought to condemn the land for a National Seashore. The landowners had an easement to use the entire beach as a private community beach; the landowners contended that this fact should be considered in determining the condemnation value. The United States District Court for the District of Maryland held that the right of landowners to use the entire ocean beach as a private community beach is a valuable easement which had to be reflected in the just compensation allowed for the taking of each lot. (Brackins-Florida)
W73-03335

POWER V. VILLAGE OF HIBBING (LIABILITY FOR FLOODING OF SEWER CAUSE BY EXTRAORDINARY RAINFALL).
233 N.W. 597-599 (Minn. 1930).

Descriptors: *Minnesota, *Flood damage, *Storm runoff, *Sewers, Cities, Floods, Flash floods, Rain water, Storms, Floodwater, Legal aspects, Judicial decisions, Damages, Remedies, Municipal wastes, Waste disposal, Sewage, Sewage disposal, Sewerage, Drainage systems, Storm drains, Water law.

Plaintiffs landowner and tenant sued defendant city for damages resulting from the flooding of the basement by water and sewage which had backed up in the sewer. The sewer had been constructed to handle surface water runoff and sewage and was built to handle the most severe rainfall previously recorded in the city. On the day of the damage the city suffered the most severe rainstorm it had ever received; this far exceeded the previous record rainfall. Plaintiffs sought relief on the three grounds of negligence, trespass, and nuisance. Plaintiffs also invoked the rule of res ipsa loquitur. The trial court directed a verdict for the defendants, and the Supreme Court of Minnesota affirmed. A city is not liable for damages for the overflow of a sewer caused by an extraordinary rainfall which could not have been reasonably anticipated in the absence of negligence in the construction or maintenance of the sewer. (Robinson-Florida)
W73-03336

WATER RESOURCES RESEARCH ACT--AMENDMENTS (LEGISLATIVE HISTORY).
U.S. Code Congressional and Administrative News, Vol 2, p 1814-1820, 1971. 1 tab.

Descriptors: *Water Resources Research Act, *Grants, *Government supports, *Legislation, Government finance, Costs, Water law, Legal aspects, Water resources development, Research and development, Information retrieval, Data collections, Administration, Water resources, Federal budget, Budgeting.

The purpose of the Water Resources Research Act--Amendments (P.L. 92-175) is to amend the Water Resources Research Act to increase the amount authorized for annual appropriations to support a water resources research center in each of the states; to provide for information retrieval and dissemination activities at each research center; to make the District of Columbia, Guam and the Virgin Islands eligible for institute grants; and to revise certain administrative procedures of the Act. This legislative history of the amendments includes committee recommendations, background of the legislation, a section by section analysis, and executive communications relevant to the legislation. The amendments authorize appropriations increases of over $8,000,000 for each fiscal year. (Brackins-Florida)
W73-03339

APPROPRIATIONS AUTHORIZATIONS--WATER RESOURCES (LEGISLATIVE HISTORY).
U.S. Code Congressional and Administrative News, Vol 1, p 1076-1078, 1971.

Descriptors: *Water Resources Planning Act, *Legislation, *Government finance, *Federal budget, Water resources development, Costs, Financing, Grants, Water law, Legal aspects, River basin commissions, Administration, Planning, Government supports.
Identifiers: *Appropriations (Water resources), *Appropriations authorization-waters resources.

The Appropriations Authorizations-Water Resources Act, P.L. 92-27, amends the existing provisions of the Water Resources Planning Act which impose ceilings upon the annual appropriations authorized for the administration of Titles I and III of the act, so as to increase the ceilings. Included in this legislative history of the Act is the background of the legislation with a brief description of the Water Resources Planning Act, committee action, committee recommendations and executive communications relevant to the bill. The bill will retain the existing ceiling on funding for river basin commissions and increases the ceiling on funds to carry out the council's coordinating functions under Title I and to administer the grant program under Title III to $1,500,000 annually. (Brackins-Florida)
W73-03340

RIVER BASIN MONETARY AUTHORIZATION ACT OF 1971.

U.S. Code Congressional and Administrative News, Vol 1, p 905-910, 1971. 1 tab.

Descriptors: *Legislation, *United States, *Federal budget, *Government finance, *River basin development, Government supports, Costs, Project planning, Water resources development, Flood control, River regulation, Channel improvement, Water supply development, Reservoir operation, Reservoir storage, Legal aspects, Grants, Budgeting, Flood protection, Columbia River, Missouri River, Ohio River, Mississippi River.
Identifiers: Arkansas River, Flood Control Act of 1970.

The River Basin Monetary Authorization Act of 1971 authorizes appropriations not to exceed $628,000,000 for river basin development, erosion control, miscellaneous facilities on the Crow Creek Sioux Reservation in South Dakota, flood control, drainage improvements, water supply, reservoir improvements and channel or river improvements. Rivers subjected to such improvements include the Columbia River, the Missouri River, the Mississippi, the Ohio, the Arkansas, the San Joaquin, the South Platte and the Alabama-Coosa Rivers. Other projects are in the Stonewall Jackson Lake, West Virginia; Benbrook Reservoir, Texas; Perry Reservoir, Kansas; Verdigris River, McClellan-Kerr River Navigation Project in Oklahoma; Whiteoak Dam and Reservoir, Ohio; and the Lower Monumental Lock and Dam Project, Washington. Also included is an amendment to section 221 of the Flood Control Act of 1970. (Brackins-Florida)
W73-03341

SALINE WATER CONVERSION ACT OF 1971 (LEGISLATIVE HISTORY).

U.S. Code Congressional and Administrative News, Vol 1, p 1215-1234, 1971. 1 tab.

Descriptors: *Legislation, *Saline water, *United States, *Desalination, *Water supply development, Water supply, Water demand, Saline water systems, Water law, Legal aspects, Federal budget, Costs, Government finance, Water resources development, Research and development, Desalination plants, Water sources, Water treatment, Water yield.
Identifiers: *Saline Water Conversion Act of 1971, Appropriations (Water resources).

The purpose of the Saline Water Conversion Act of 1971 is to extend the life of the saline water conversion program until 1977, to up-date the law, to authorize appropriations for the program for fiscal year 1972 and to give redirection and emphasis to the program in the light of current needs and opportunities. Included in this legislative history report of the Act are remarks on the background of the Act, the need for the legislation and a section by section analysis. The amount of the appropriation for the bill is $27,025,000. Also included are committee recommendations and executive communications dealing with the bill. An environmental impact statement of the bill is also included. Water supplies must be augmented to provide for the needs of a growing population, however, the means for increasing such supplies are limited. This saline water conversion program is the only federal research and development program for providing practical means of converting saline waters into water suitable for beneficial uses. (Brackins-Florida)
W73-03342

TINICUM NATIONAL ENVIRONMENTAL CENTER.

U.S. Code, Congressional and Administrative News, 1972. p 2674-2676.
Identifiers: *Tidal marshes, *Wetlands, *Legislation, *United States, Wildlife conservation, National Wildlife refuges, Natural resources, Pennsylvania, Administrative agencies, Administrative costs, Habitats, Environmental control, Marsh management, Coastal marshes, Marshes, Conservation.

The Secretary of the Interior is authorized to acquire by donation, purchase with donated or appropriated funds, by exchange of federally owned lands in the vicinity, or otherwise as he deems necessary the natural area known as Tinicum Marsh for the purpose of preserving, restoring, and developing it. This Act creates the Tinicum National Environmental Center, to be administered as a unit of the National Wildlife Refuge System for the purpose of promoting environmental education, and to afford visitors an opportunity for the study of wildlife in its natural habitat. The Secretary of the Interior may enter into cooperative agreements to carry out provisions of the Act. Funds are authorized for appropriation. (Tolle-florida)
W73-03343

TINICUM NATIONAL ENVIRONMENTAL CENTER--LEGISLATIVE HISTORY.

1972 U.S. Code Congressional and Administrative News, p 2819-2827.

Descriptors: *Tidal marshes, *Coastal marshes, *Legislation, *National wildlife refuges, *United States, Natural resources, Pennsylvania, Administrative agencies, Administrative costs, Habitats, Environmental control, Highway effects, Marsh management, Wetlands, Marshes, Conservation.

This legislative history gives a section by section analysis of the bill. Also included is an analysis of the background and need for the legislation with two studies recommending creation of the center. The purpose of the legislation is to preserve the last true tidal marshland in Pennsylvania. To accomplish this the Secretary of the Interior would be authorized to acquire the lands in the Tinicum Marsh. Included are departmental reports from interested agencies as to the proposed center. The Committee on Commerce recommended the bill. (Tolle-Florida)
W73-03344

DAMS-INSPECTION-SECRETARY OF ARMY.
P.L. 92-367, 86 Stat. 506, 1972 U.S. Code Congressional and Administrative News, p 3296-3298.

Descriptors: *United States, *Dams, *Legislation, *Inspection, Regulation, Seepage, Impoundments, Settlement (Structural), Erosion sedimentation, Cracking, Earthquakes, Bulkheads, Gates, Water law, Streams, Watercourses (Legal aspects), International Boundary and Water Commission, On-site investigations.
Identifiers: Army Corps of Engineers.

The Secretary of the Army, through the Chief of Engineers, is to carry out a national program of inspection of dams for the purpose of protecting human life and property. Exceptions to inspection include dams under the jurisdiction of the Bureau of Reclamation, the Tennessee Valley Authority, the International Boundary and Water Commission, and the Federal Power Commission. After inspection of a dam, the Secretary shall notify the Governor of the state in which the dam is located of the results of the investigation including any hazardous conditions and measures necessary to overcome such conditions. The Secretary shall report to the Congress (1) an inventory of all dams located in the United States; (2) a review of each inspection made, the recommendations furnished to the Governor of the state in which such dam is located and information as to the implementation of such recommendation; and (3) recommendations for a national program for the inspection, and regulation for safety purposes of dams of the Nation, and the respective responsibilities which should be assumed by federal, state and local governments and by public and private interests. (Tolle-Florida)
W73-03345

DAMS--INSPECTION--SECRETARY OF ARMY--LEGISLATIVE HISTORY.

1972 U.S. Code Congressional Administrative News, p 3436-3439.

Descriptors: *Legislation, *Dams, *Inspection, *United States, Financing, Regulation, Water law,

Floods, Flood protection, Inspection, Impoundments, History, Watercourses (Legal aspects), Impounded waters, Water control, Flood damage.
Identifiers: Army Corps of Engineers.

This legislative history gives a section by section breakdown and summary of the act. Due to the large number of dams in this country, the growth of industry and urban areas below the dams, and with recent failures, it has become an urgent matter that these structures raise no questions as to their safety. Included within the scope of this act are non-federal and federal dams. This legislation will, for the first time, provide an accurate assessment of the scope of the problem which the nation faces with respect to unsafe dams. It will also provide a study and recommendations for a comprehensive national program for the inspection and regulation for safety purposes of dams of the Nation, and for an appropriate sharing of responsibilities between federal, state and local governments and public and private interests. The Committee on Public Works recommended enactment of the bill. A summary of costs of the bill is included. (Tolle-Florida)
W73-03346

PUBLIC WORKS FOR WATER AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATION ACT, 1973.

U.S. Code Congressional and Administrative News, p 3749-3759. 1972.

Descriptors: *Legislation, *Administrative agencies, *Federal budget, *United States, *Budgeting, Water law, Administration, Federal government, Water resources development, Financing, Grants, Government finance, River basin commissions, Delaware River Basin Commission, National Water Commission, Tennessee Valley Authority.
Identifiers: Interstate Commission on the Potomac River Basin, Water Resources Council, Army Corps of Engineers.

This is an Act making appropriations for public works for water and power development, including the Corps of Engineers-Civil, the Bureau of Reclamation, the Bonneville Power Administration and other power agencies of the Department of the Interior, the National Water Commission, the Susquehanna River Basin Commission, the Delaware River Basin Commission, the Tennessee Valley Authority, the Interstate Commission on the Potomac River Basin, and the Water Resources Council for the fiscal year ending June 30, 1972. Appropriations to the Corps of Engineers are for studies, plans and projects for river and harbor projects, flood control, shore protection and for operation and maintenance of such projects. Appropriations to the Interior Department cover water conservation, reclamation and irrigation projects. (Tolle-Florida)
W73-03347

RURAL DEVELOPMENT ACT OF 1972--LEGISLATIVE HISTORY.

U.S. Code Congressional and Administrative News, p 4063-4104, 1972. 2 tab.

Descriptors: *Legislation, *Watershed management, *Water quality control, *Water storage, *Water supply development, United States, Water sources, Water management (Applied), Financing, Planning, Governmental interrelations, Government finance, Grants, Municipal water, Pollution abatement, Sewage disposal, Rural areas, Water supply, Solid wastes, Legal aspects, Water distribution (Applied).
Identifiers: *Rural Development Act.

This legislative history includes a section by section commentary on provisions of the Act. The purpose of the Act is to provide an effective program to enable rural America to offer living conditions and employment opportunities adequate to impede the steady flow of rural Americans to our Nation's large population centers. Cited in need for the legislation are problems such as water quality management, watershed management, municipal and industrial water, and pollution abatement facilities. Included are a Five Subsequent Fiscal Year Cost Estimate and section by section comments from the conference committee. The Committee on Agriculture recommended the bill. (Tolle-Florida)
W73-03348

RESOURCE CONSERVATION AND DEVELOPMENT PROJECTS--FEDERAL ASSISTANCE.

U.S. Code Congressional and Administrative News, p 2468-2469, 1970.

Descriptors: *Government finance, *Cost sharing, *Projects, *Water resources development, Legislation, Federal government, State governments, Administrative agencies, Administration, Conservation, Wildlife conservation, Fish, Recreation, Reservoirs, Recreation facilities, Public health, Easements, Land, Right-of-way.
Identifiers: *Bankhead-Jones Farm Tenant Act.

Under an amendment to the Bankhead-Jones Farm Tenant Act, the Secretary of Agriculture is authorized to bear a proportionate share of the cost of installing improvement works applicable to public water-based fish and wildlife or recreational development. All engineering and other technical assistance costs relating to such development may be provided by the Secretary. Where a state, a public agency, or a local nonprofit organization agrees to operate a reservoir or other area, no more than one-half of improvement costs may be borne by the Secretary. In no event may the Secretary share costs in installing more than one improvement for each seventy-five thousand acres in any project. Finally, all developments shall be consistent with any existing statewide outdoor recreation plan found adequate for the purposes of the Land and Water Conservation Fund Act of 1965 (78 Stat. 897), and cost-sharing shall be authorized only if the Secretary determines it cannot be provided under other existing authority. (Duss-Florida)
W73-03349

CHARLES V. DIAMOND (RESTRICTION ON DEVELOPMENT AFFECTING OVERLOADED SEWAGE SYSTEM).

336 N.Y.S.2d 256-258 (Sup. Ct. 1972). 3 p.

Descriptors: *New York, *Judicial decisions, *Water quality standards, *Sewage disposal, Watercourses (Legal aspects), Water law, Legal aspects, Water pollution control, Pollution abatement, Municipal wastes, Wastes disposal, Law enforcement, Administrative decisions, Legal review, Adjudication procedure, Water quality control, Permits.

Petitioner, landowner, brought suit against respondent Commissioner of Environmental Conservation to compel approval of sewer connections to petitioner's property, to take appropriate steps so that the petitioner can use the village sewer system and to recover money damages. Petitioner's application for a permit to construct a sewer extension tying into the existing village system was denied by the State Department of Environmental Conservation because of the present pollution problem in the village sewer system. Discharges from the village system currently contravene stream standards. Petitioner does not question the existence of the pollution problem, but contends that a failure to correct the problem results in a confiscation of his property without compensation. The New York Supreme Court for Onondaga County held that the Commissioner has not abused his discretion, that the public good to be promoted by the temporary restriction on any further development which would affect the village's sewer system may be validly imposed and thus respondent is entitled to judgment dismissing the petition. (Brackins-Florida)
W73-03355

UNITED STATES V. 421.89 ACRES OF LAND, MORE OR LESS, ETC. (COMPENSATION FOR FLOW EASEMENT).
465 F 2d 336-340 (8th Cir. 1972). 5 p.

Descriptors: *United States, *Easements, *Condemnation, *Compensation, Iowa, Eminent domain, Levees, Road, Drainage, Borrow pits, Judicial decisions, Mining, Dams, Market value, Legal aspects, Evaluation, Appraisal, Value, Gravels.

Plaintiff government commenced action to acquire flowage, levee, road, drainage, and borrow pit easements for a dam project from defendant landowners. The trial court appointed a commission to fix compensation. Landowners' main contention was that suspension of its gravel mining because of high water due to the flowage easement was not adequately compensated for in the commission's determination of diminution in market value of $200 per acre. Landowners urged the court erred in receiving evidence, over their objection, of comparable sales in the market area. The United States Court of Appeals for the Eighth Circuit held the court did not err in receiving evidence of witness, qualified as expert on real estate, gravel deposit properties and flowage easements whose comparable sale basis in evaluation of property for appraisal was used to fix compensation. The court affirmed the trial court's award of damages for diminution of market value of the land. (Tolle-Florida)
W73-03356

PEOPLE, TOWN OF SMITHTOWN V. POVEROMO (TOWN ORDINANCE REQUIRING PERMIT FOR FILLING IN FORESHORE OF RIVER IS UNCONSTITUTIONAL).
336 N.Y.S.2d 764-780 (Dist. Ct. 1972). 17 p.

Descriptors: *New York, *Judicial decisions, *Ownership of beds, *Permits, *Wetlands, Constitutional law, Local governments, Watercourses (Legal aspects), Law enforcement, Legislation, Legal aspects, Navigable rivers, Intertidal areas, Beds under water, State governments, State jurisdiction, Public rights, Water rights, Riparian rights, Boundaries (Property), High water mark, Streambeds, Shores.
Identifiers: *Fill permits, *Public trust doctrine, Foreshores.

Defendant landowner was charged with violating the city code in a criminal action. Defendant was filling in property on the foreshore of a navigable river without a permit from the city as required by the city code. In 1963 the state had granted the land under the river to the city. Defendant alleged the charge should be dismissed because the permit ordinance was unconstitutional. The New York District Court in Suffolk County held that the state's grant of land under the river to the city was limited by the public trust in favor of the people; that the state may grant to individuals limited privileges in lands under navigable waters, but not so as to divert them or the waters thereon from their proper uses for the public welfare, or so as to relieve the state of the control and regulation of the uses of these lands and waters; that this trust doctrine extends to the furthermost reaches of the incoming tides; and that the state precluded regulation and control of water resources of the state by municipalities in adopting the Conservation Law. The court therefore dismissed the informa-

tion because the city's permit ordinance was unconstitutional. (BrackinseFlorida)
W73-03357

HARDWICKE V. UNITED STATES (PROPERTY VALUATION MUST CONSIDER POSSIBLE DETRIMENT DUE TO DIVERSION DAM).

467 F.2d 488-491 (Ct. Cl. 1972). 4 p.

Descriptors: *United States, *Diversion dams, *Judicial decisions, *Property values, *Easements, Rio Grande River, Mexico, Legal aspects, Water control, Dams, Water law, Flood routing, Flood recurrence interval, Flood plains, International commissions, Compensation, Treaties, International Boundary and Water Commission, Project planning, Inlets (Waterways), Texas, Floods, Flood frequency.
Identifiers: *Flow easements, *Miller Doctrine.

Plaintiff landowners sought compensation under Fifth Amendment from defendant United States for taking flowage easement over portion of tract located in flood plain. The alleged taking is based on a decision by an international commission, responsible for flood control plans on the lower Rio Grande River and prompted by natural flooding of a populated area, to close gates of a diversion dam resulting in flooding of plaintiffs property. Plaintiffs' allege compensation should be based on lowered land value from $392,500 to $352,250 caused by increased flooding incidence since construction of the diversion dam. The flood control program originally constructed storage dams which reduced flood incidence on plaintiffs' property, made it suitable for farming and increased the value from $170,000 to $392,500. Defendant contended flooding increase and resulting reduction in land value due to diversion dam construction should be weighed against the benefit received from the total program. The Court of Claims held that plaintiffs could not claim a taking based on the enhanced value caused by the storage dam without deduction for the probable detriment due to the diversion dam, and were not entitled to compensation. Petition dismissed. (Tolle-Florida)
W73-03358

SUNSET TRAILS WATER COMPANY V. ILLINOIS COMMERCE COMMISSION (VILLAGE RIGHT TO PLAN UNIFIED WATER SYSTEM).

287 N.E.2d 736-741 (Ill. 3d D.C.A. 1972). 6 p.

Descriptors: *Illinois, *Water works, *Water supply, *Administrative agencies, *Decision making, Regulation, Water wells, Water tanks, Water storage, Resources, Judicial decisions, Costs, Financing, Local governments, Project planning, Legal aspects, Public utilities, Water distribution (Applied), Administrative decisions, Construction, Permits, Standards, Water quality control, Water management (Applied).
Identifiers: *Illinois Commerce Commission, *Licenses.

Plaintiff water company sought approval of certificate of convenience and necessity denied by defendant Illinois Commerce Commission. The required certificate was to operate a public utility water system providing service to a subdivision within a village's corporate limits. The subdivider-owner also owned the water company and desired the required certificate to activate the company in development of the subdivision. The village was developing a unified water system, eventually to include the subdivision with integrated service from the standpoint of emergency and standby service and fire protection. The plaintiff averred the Commission's denial lacked specificity and that the decision that a single unified system would best serve the public interest was contrary to law and fact. The Appellate Court of Illinois for the Third District held that evidence of substantial steps taken by the village toward development of a unified water system far superior to the one proposed by the water company supported the Commerce Commission's determination, and the granting of the certificate to the water company neither promoted public convenience nor was necessary thereto. The court refused to overturn the Commission's denial of the certificate thereby affirming the circuit court. (Tolle-Florida)
W73-03359

HUGHES V. RANGER FUEL CORP., DIVISION OF PITTSTON CO. (STANDING OF PRIVATE PERSONS TO ENFORCE RIVERS AND HARBORS ACT).

467 F.2d 6-11 (4th Cir. 1972). 6 p.

Descriptors: *United States, *Rivers and Harbors Act, *Navigable rivers, *Federal jurisdiction, *Judicial decisions, West Virginia, Landslides, Legal aspects, Water pollution, Navigable waters, Water pollution sources, Legislation, Water law, Jurisdiction, Law enforcement, Coal mines, Watercourses (Legal aspects).
Identifiers: *Refuse Act of 1899, *Standing (Legal), Injunctions (Prohibitory).

Plaintiff informers sought injunctive relief and damages from defendant coal company and its employees for alleged assault. Allegedly a landslide blocking a public highway was bulldozed into a navigable stream by employees of the coal company, and while on a public highway photographing these circumstances so as to turn in the coal company for violation of the Rivers and Harbors Appropriation Act of 1899, plaintiffs were assaulted by defendant employees. Plaintiff contends that citizens should be protected when helping to enforce the pollution laws. Defendant contended grave threat to constitutional rights if self-appointed informers were given the power and right not to be restricted or interfered with in their quest for evidence of a federal criminal violation. The United States Court of Appeals, Fourth Circuit, held that an informer, while entitled to share in the fine if there is a government prosecution under the Rivers and Harbors Appropriation Act of 1899, has no standing otherwise. District Court's dismissal, on defendant's motion for summary judgment, affirmed. (Tolle-Florida)
W73-03360

MODEL STATUTE: INTERNATIONAL DRAINAGE BASIN POLLUTION CONTROL,
Denver Univ., Colo. Coll. of Law.
For primary bibliographic entry see Field 05G.
W73-03361

INTERNATIONAL CONTROL OF RIVER WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W73-03362

POLLUTION OF THE GREAT LAKES: A JOINT APPROACH BY CANADA AND THE UNITED STATES,
For primary bibliographic entry see Field 05G.
W73-03363

SOURIS-RED-RAINY RIVER BASINS COMMISSION, ANNUAL REPORT FISCAL YEAR 1971.
Water Resources Council, Washington, D.C.

Available from the National Technical Information Service as PB-209 165, $3.00 in paper copy, $0.95 in microfiche. June 1971. 49 p, 2 map, 9 photo, 1 tab.

Descriptors: *Environmental effects, *Minnesota, *North Dakota, *South Dakota, *River basins, *River basin commissions, River basin development, Optimum development plans, Resources, Resource development, Water resources development, Comprehensive planning, Basins, Interstate commissions, Watershed management, Planning, Watersheds (Basins).

The Commission will avoid unnecessary duplication by merging the region-wide Type I study with the more detailed Type II study of the Bois de Sioux-Mustinka Wild Rice (North Dakota), and Red River main stem planning subregions. Good progress was made during fiscal year 1971 on the Type I framework study. The Commission also completed a listing of projects and programs needed to meet needs for water and related land resources development in the region. The main objective for fiscal year 1972 is the completion and publication of the combined study report which will include the Type I and II study results and will provide decision makers with an array of choices in making short and long range development decisions. A report on water needs, availability, and problems; a list of other reports in progress; a general statement of goals and plans for 1972; Commission comments; Citizens Advisory Council comments; and the fiscal year 1971 audit are included. (Beardsley-Florida)
W73-03559

WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W73-03562

NEW JERSEY SPORTS EXPOSITION AUTHORITY V. MCCRANE (FUTURE ECOLOGICAL DAMAGE NOT TO INVALIDATE SPORTS AND EXPOSITION LAW).
119 N.J. Super. 457, 292 A.2d 580-641 (1971).

Descriptors: *New Jersey, *Environmental effects, *Constitutional law, *Legislation, *Judicial decisons, Legal aspects, Common law, State governments, Administrative agencies, Wetlands, Ecology, State jurisdiction, Administration, Governments, Recreation, Government interrelations, Public rights, Public benefits.

Plaintiff, New Jersey sports and exposition authority instituted a suit for declaratory judgment as to the validity of the sports and exposition authority law. The law permits the construction of a multi-purpose sports complex on a 750-acre site in Hackensack, New Jersey. The conveyance of meadow lands that were held in trust for the public by the state does not violate the public trust doctrin since the doctrine allows for loss of such property when it is still to be used, as here, to promote the interest of the public. The court held that the inclusion of a race track in no way detracted from the public purpose character of the project and that just compensation had been safeguarded with the proceeds going to the support of free public schools. The possibility of future ecological damage resulting from the project's construction does not invalidate the law in view of the administrative and legislative restrictions on activities which can be conducted in tidelands areas. (Beardsley-Florida)
W73-03563

SOURIS-RED-RAINY RIVER BASINS COMMISSION, ANNUAL REPORT, FISCAL 1970.
Water Resources Council, Washington, D.C.

Available from the National Technical Information Service as PB-209 161, $3.00 in paper copy, $0.95 in microfiche. June 1970. 44 p, 2 map, 22 photo, 2 chart.

Descriptors: *River basin commissions, *Watershed management, *Water management (Applied), *River basins, South Dakota, Environmental effects, Minnesota, North Dakota, Flood control, Flood protection, Water quality, Irriga-

tion programs, Fishing, Recreation, Wildlife conservation, Flood plains, Watersheds (Basins), River basin development, Erosion control, Surface runoff, Interstate commissions, Water supply, Drainage programs.
Identifiers: *Souris-Red-Rainy River Basins.

This annual report contains a financial statement of the Commission; a general statement of Commission goals and plans for fiscal year 1971; substantive accomplishments of the Commission through June 30, 1970; relationship of Title III programs to state input; a report of water needs, availability and problems; and the By-laws of the Commission. Programs of the Commission which are described briefly include drainage, irrigation, watershed management, municipal and industrial water supply, electric power production, mineral extraction, transportation, recreation, fish and wildlife protection, water quality control and flood prevention and control. Also included are comments from the Commissioners, a history of previous planning and organization of the Commission. The Executive Order which created the Commission in 1967 is also reprinted. (Brackins-Florida)
W73-03567

MARITIME UNIFORMITY VERSUS COMPELLING STATE INTEREST IN CONTROLLING OIL POLLUTION OF NAVIGABLE WATERS,
For primary bibliographic entry see Field 05G.
W73-03568

THE SUPREME COURT AND THE ENVIRONMENT: A NEW ROLE FOR THE 1970'S.,
Purdue Univ., Lafayette, Ind.
W. A. Wilbur.
Proceedings of the Indiana Academy of the Social Sciences--1971, p 88-97, 1972. 28 ref.

Descriptors: *United States, *Judicial decisions, *Federal jurisdiction, *Water pollution control, Great Lakes, Ohio, Lake Erie, Water law, Legal aspects, Legislation, Interstate commissions, Pollutants, Conservation, Navigable rivers, Rivers and Harbors Act, Natural resources, Watercourses (Legal aspects), Industrial wastes, Water pollution, Water quality control, Environmental control.
Identifiers: *Standing (Legal), *Nuisance (Legal aspects), National Environmental Policy Act.

The U.S. Supreme Court has decided fifty-one cases related to conservation or pollution control between 1899-1971. Twenty could be unquestionably designated as pollution cases, and in the remainder the pollution/conservation issue was an important but not overriding consideration. In State of Ohio v. Wyandotte Chemicals Corp. et. al. (1971) Justice Harlan stated that the Court refuses to enter legal proceedings dealing with interstate pollution disputes bottomed on local law. The Wyandotte decision suggests that the Supreme Court will not grant a hearing in environmental cases where federal law is not an issue. It would be inaccurate to assume that the Court's self-imposed restraint on hearing environmental suits necessarily represents a defeat for the ecology-conscious public. Possible citizen standing in state and lower federal courts under Flast v. Cohen (1968) will provide a broader legal basis for preventing allocation of public funds for projects which have dubious ecological consequences. However, judging by the Wyandotte decision and President Nixon's emphasis on state and local initiatives for pollution control, the Supreme Court will not play a central role in pollution cases in the 1970's. (Tolle-Florida)
W73-03570

FOURTH ANNUAL CONFERENCE, STATE AND FEDERAL WATER OFFICIALS: LAND AND WATER ISSUES OF THE SEVENTIES.
Water Resources Council, Washington, D.C.

Available from the National Technical Information Service as PB-209 155, $3.00 in paper copy, $0.95 in microfiche. Proceedings of the Fourth Annual Conference of State and Federal Water Officials, June 30-July 2, 1970, Charleston, South Carolina, sponsored by Water Resources Council, Washington, D.C. 1970. 191 p.

Descriptors: *Governmental interrelations, *Watercourses (Legal aspects), *Flood plain zoning, *Federal-state water rights conflicts, Water resources development, Constitutional law, Water resources, Estuaries, Riparian land, Legal aspects, Eminent domain, Public lands, Public rights, Legislation, Prior appropriation, Reservation doctrine, Water law, Water pollution control, U.S. Water Resources Council, State governments.
Identifiers: *National Environmental Policy Act of 1969, Navigational servitude.

The opening remarks to the Conference discussed the need for combined federal and state government action in the solution of water-related problems. Several programs and recommendations of the Water Resources Council were reviewed. Conference panelists discussed the question, 'Water as Property: Private, State or Federal'. In this context, an analysis was made of the reservation doctrine, the appropriation doctrine and the navigational servitude doctrine. Other topics discussed by panelists were floodplain and coastal zone management and effective state and federal partnerships in water and related land resource planning. Panelists detailed the reactions of the geographical units of the United States to these issues. The organization and programs of the New England River Basin Commission were also described. The role of the United States Department of Agriculture in water and related land resources planning and development was discussed, as was the National Environmental Policy Act of 1969. Also included is an address on water pollution. (Reed-Florida)
W73-03571

DEPARTMENT OF DEFENSE ENVIRONMENTAL QUALITY PROGRAM.
Office of the Deputy Assistant Secretary of Defense for Environmental Quality, Washington, D.C.

Available from the National Technical Information Service as AD-742 107, $3.00 in paper copy, $0.95 in microfiche. January 1, 1972. 111 p, 4 fig, 17 tab, 17 ref.

Descriptors: *Environmental effects, *Environmental control, *Military aspects, *Pollution abatement, Federal government, Water quality control, Water pollution control, Air pollution, Pollutants, Toxins, Wastes, Radioactive wastes, Research and development, Soil contamination, Construction, Programs, Civil engineering, Environmental engineering.
Identifiers: *Department of Defense.

This report replaces the annual report published in previous years by the Department of Defense Environmental Pollution Control Committee. Information is provided on the activities, accomplishments and future plans of the military departments in the Environmental Quality Program as of January 1, 1972. The status of the Department of Defense pollution abatement programs, the items of continuing interest, and subjects that will require increased attention in the future are discussed. These programs for protection and enhancement of the Nation's environment include those to abate air, water, noise, land and radiation pollution; solid waste, toxic and hazardous materials disposal; research and development activities; and training programs. The specific programs of the Defense Supply Agency, Army (military activities), Army (civil works), Navy and Air Force are reviewed in separate chapters. Appendices include environmental considerations in Department of Defense actions, the 1972 Military Construction Program, and the proposed 1973 Military Construction Program. (Beardsley-Florida)
W73-03572

ABSTRACTION AND USE OF WATER: A COMPARISON OF LEGAL REGIMES.
Department of Economic and Social Affairs (UN), New York.

United Nations Report, ST-ECA-154, 1972. 254 p, 1214 ref.

Descriptors: *Water consumption, *Water utilization, *Water rights, *Water users, United Nations, Surface waters, Riparian rights, Water resources development, Groundwater, Thermal power, Water law, Natural flow doctrine, Reasonable use, Municipal wastes, Industrial wastes, Water resources, Irrigation water, Water sources, Sewerage, Legal aspects, Foreign countries, Permits, Industrial water, Water management.

A legal history and international analysis are presented of: systems of acquisition of surface and groundwater rights, priorities among users, water supply organization, procedural requirements for acquisition of water rights, right of access to water, payment for water supplies, and scope and exercise of water use rights. Rapid population growth will mean a drastic increase in use of water for domestic purposes, for food production through irrigated agriculture and for industry. Unlike other uses, such as navigation, fishing and hydroelectric power production, these activities will substantially deplete the water sources. This is done by actually using up a large percentage of water as in irrigation and some types of food-processing and by returning water to the source of supply so changed in quality (by domestic sewage, industrial waste, land drainage or thermal pollution) as to make that source unavailable to succeeding users without extensive treatment. In this context, the developing countries of the world have devised methods and programs for solving these anticipated water needs by stimulating the machinery to modernize water laws. (Tolle-Florida)
W73-03576

CORNISH V. KINDER CANAL CO. (CANAL NOT CONSIDERED NON-NAVIGABLE NATURAL STREAM IN OWNERSHIP DISPUTE).
267 So. 2d 625-631 (La. Ct. App. 1972).

Descriptors: *Louisiana, *Boundary disputes, *Legislation, *Canals, *Ownership of beds, Streams, Properties, Water rights, Water law, Judicial decisions, Legal aspects, Streambeds, Watercourses (Legal aspects), Riparian rights, Adjudication procedure, Beds under water, Navigable waters, Right-of-way, Boundaries (Property).
Identifiers: *Declaratory judgment decree.

Plaintiff landowners filed for declaratory judgment decree for ownership of canal bottom against defendant canal company and owner of oil, gas and mineral lease. The question involved a deed conveying a portion of certain property lying adjacent to the canal. The deed was executed prior to enactment of a statute creating a conclusive presumption that a land transfer includes all the grantor's interest in the bed of a canal up to the center of it. The Court of Appeals of Louisiana, Third Circuit, held that rules relating to ownership of the beds of nonnavigable natural streams do not apply to canals, especially when the canals were constructed on servitudes granted for that purpose. The court further held the deed was conveyed

prior to enactment of the statute; thus the statute is inapplicable. The deed did not convey to the purchaser any part of the bed of the canal and the purchaser's successors in title did not own overriding royalties affecting the bed or bottom of the canal. (Tolle-Florida)
W73-03577

HAWKINSON V. BLANDIN PAPER CO. (DAMAGES SOUGHT FOR WASTE DISPOSAL IN RIVER).

347 F. Supp. 820-823 (D. Minn. 1972).

Descriptors: *United States, *Waste disposal, *Judicial decisions, *Pulp wastes, *Rivers and Harbors Act, Mississippi River, Waste water (Pollution), Industrial wastes, Minnesota, Sewage disposal, Federal jurisdiction, Watercourses (Legal aspects), Depreciation, Negligence, Legal aspects, Sewage treatment, Sewage, Dams, River beds, Municipal wastes, Treatment facilities, Navigable rivers, Legislation, Water pollution sources.
Identifiers: Injunctive relief (Prohibitory), Proximate causation.

Plaintiff riparian landowner sought damages and injunctive relief from defendant village and paper company for causing depreciation in value to his riverfront property by inter alia depositing waste and refuse in the river without authority. Defendant paper company dumped waste into a manhole of the municipal waste system. Plaintiff alleged that in constructing the sewerage disposal plant, the village changed the location of the river's channel, directing the waste to plaintiff's property. Plaintiff also claimed that the village dumped waste into the river at municipally constructed platforms, and that the waste gathered in front of plaintiff's property. Defendants contended that these acts did not occur and even if they did there was no causal connection between their actions and the lodging of debris in front of plaintiff's property. The district court held that the plaintiff failed to establish by a preponderance of the evidence that any acts of either defendant constituted a violation of the Rivers and Harbors Act of 1899 or of Minnesota law which would entitle plaintiff to monetary damages or injunctive relief. Judgment for defendants. (Tolle-Florida)
W73-03578

MARINE FISHERIES AND LAW OF THE SEA.
Sport Fishing Inst., Washington, D.C.

SFI Bulletin, No. 240, p. 1-3, November-December 1972.

Descriptors: *Continental shelf, *Sport fishing, *Commercial fishing, *International law, *Law of the sea, Oceans, Marine fisheries, International commissions, Federal jurisdiction, Atlantic Ocean, Continental margin, Coasts, United States, Administrative agencies, United Nations, Atlantic salmon, Foreign countries, International waters, Jurisdiction.

For a decade there has been rapid escalation in the fishing effort exerted on U.S. coastal marine fisheries by the distant-water fishing fleets of foreign nations. At the 1974 U.N.-sponsored, worldwide Law-of-the-Sea (LOS) Conference encroachment of foreign-flag fishing vessels on the U.S. Continental Shelf will be a main topic for discussion and policy formulation. A present U.S. proposal prepared by the Ocean Affairs Staff of the U.S. State Department specifies a 'species approach' to 'preferential rights' of all living coastal marine resources, other than migratory species, to be reserved to the coastal nation involved. An alternative approach, extended fisheries jurisdiction to the outer edge of the Continental Shelf (200 miles offshore), would protect both sport and commercial marine fisheries. This reiterates the 'patrimonial sea' concept recently espoused by the Sport Fishing Institute. A number of bills introduced in the 92nd Congress espoused these jurisdictional lines. None came before public hearing. Undoubtedly, a number of new bills for the same purpose will be reintroduced in the 93rd Congress. Events are developing in such a way that 1973 may well be a year of unilateral U.S. decision making in the area. Included is the full text of the Truman Proclamation on coastal fisheries. (Tolle-Florida)
W73-03579

STATE AND LOCAL WETLANDS REGULATION: THE PROBLEM OF TAKING WITHOUT JUST COMPENSATION.
Virginia Law Review, Vol 58, p 876-906, 1972. 110 ref.

Descriptors: *Wetlands, *Coastal marshes, *Land use, *Compensation, *Legislation, Administrative agencies, Permits, Constitutional law, Water law, Eminent domain, Condemnation, Water pollution, Legal aspects, Land management, Regulation, Judicial decisions, Administrative decisions.
Identifiers: *Public trust doctrine, Nuisance (Legal aspects).

State courts have applied strict standards, based upon their own constitutional provisions, in determining when land-use regulation becomes a taking of property for public use without just compensation. This requirement of compensation is analyzed in an examination of coastal wetlands protection laws. Several state statutes are discussed in detail. Three possible rationales are found which may underlie legislative decisions to regulate wetlands; the need for compensation will be determined by which rationale supports the regulation. One rationale is efficiency, another is founded on common law nuisance principles, and a third is a legislative exercise of special regulatory powers over wetlands held under the public trust doctrine. These rationales are discussed and it is noted that under the first the legislature ought to provide compensation; that under the second, regulations may be enforced without compensating the landowner; and that under the third, the legislature probably need not compensate property owners for resulting losses. However, the best solution to the compensation problem, may be the establishment of a state agency which would issue permits for wetlands development, based upon an evaluation of the existing situation. (Reed-Florida)
W73-03580

BITUMEN IN THE WATERS OF BABYLONIA: THE IMPACT OF RECENT LEGISLATION ON THE LIMITED LIABILITY ACT OF 1851,
A. J. Armstrong.
The JAG Journal, Vol 26, p 215-224, 1972. 54 ref.

Descriptors: *Oil pollution, *Legislation, *United States, *Water law, *Water pollution control, Legal aspects, Water pollution sources, Coasts, Water quality control, Oil industry, Pollution abatement, Federal government, Beaches, International commissions, Insurance, Compensation, Damages, Ships, Oceans, Oil spills, Penalties (Legal).
Identifiers: *Absolute liability, Coastal waters, Water Quality Improvement Act, 1969 Convention on Civil Liability for Oil Pollution Damage, Limited Liability Act of 1851, Merchant Marine Act of 1970.

The Limited Liability Act of 1851 is analyzed in light of two statutes: the Merchant Marine Act of 1970, directed at rejuvenating the United States maritime industry, and the Water Quality Improvement Act of 1970, directed at preserving the coastal environment by introducing the concept of absolute liability with a $14 million limit where costs of oil-pollution cleanup would otherwise fall on the U.S. Government. This legislation read in conjunction with the 1969 Convention on Civil Liability for Oil Pollution Damage, indicates an implicit reevaluation of the continuing validity of century-old concepts of maritime risk. At least in situations in which innocent victims of maritime accidents are involved, the better place for the risk to fall is not on the victim, but on the maritime industry. This latter alternative ultimately will cause the risk to be spread among the subsidy-paying public at large. There remains the question, however, of whether Congress will extend the absolute-liability concept or will continue to stay one disaster behind, especially if it is confronted by strong maritime shipping and insurance lobbies. (Tolle-Florida)
W73-03581

U.S. JOURNAL: THE COASTLINE,
C. Trillin.
The New Yorker, Vol XLVIII, No 39, p 215, 216, 218, 221, 223, 224, November 18, 1972.

Descriptors: *Public access, *Beaches, *Coasts, *Land development, Legal aspects, Judicial decisions, Land use, Right-of-way, High water mark, Trespass, Legislation, Public rights, Public lands, Local governments, State governments, Intertidal areas, Recreation, Seashores, California, Permits, Land management, New Jersey.
Identifiers: Public trust doctrine, Foreshores.

Proposition 20, an initiative passed by the voters of California in November, is a land planning proposal which gives regional commissions the authority to control shoreline development through a permit system until an over-all land-use plan has been adopted by the state legislature. Its proponents argued that the shoreline, being a limited and unique resource, should be publicly controlled and protected. The opposition, mostly land-development companies, claimed the permit system would constitute a confiscation of private property. In two cases known collectively as Gion-Dietz, the California Supreme Court ruled that beach land used freely by the public for five years became public land unless the owner could show that he had made strenous effort to keep the public out. During 1972 there were some serious legal assaults on the practice East Coast towns have of reserving their beaches for local residents through parking stickers, beach fees or identification bracelets. The New Jersey Supreme Court held that a municipality could not charge outsiders higher beach fees than it charged local users. (Brackins-Florida)
W73-03582

WATER QUALITY STANDARDS SUMMARY FOR INTERSTATE WATERS IN THE DISTRICT OF COLUMBIA.
District of Columbia Dept. of Public Health, Washington.
For primary bibliographic entry see Field 05G.
W73-03583

O'NEILL UNIT, MISSOURI RIVER BASIN PROJECT, NEBRASKA.
For primary bibliographic entry see Field 08A.
W73-03584

POLECAT BENCH UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, WYOMING.
For primary bibliographic entry see Field 08A.
W73-03585

NORTH LOUP DIVISION, MISSOURI RIVER BASIN PROJECT, NEBRASKA.
For primary bibliographic entry see Field 08A.
W73-03586

THE CHESAPEAKE AND DELAWARE CANAL.
For primary bibliographic entry see Field 08A.

W73-03587

AMEND WATER RESOURCES PLANNING ACT.

Hearing--Subcomm. on Irrigation and Reclamation--Comm. on Interior and Insular Affairs, U.S. House of Representatives, April 26, 1971. 36 p.

Descriptors: *Water Resources Planning Act, *River basin commissions, *Administrative costs, Administrative agencies, Water resources development, Decision making, State governments, Grants, Legislation, Project planning, Water conservation, Federal government, Comprehensive planning, Federal budget, Budgeting, Government finance, Legal aspects.

This hearing concerned testimony on H.R. 6359, amending the Water Resources Planning Act so as to authorize increased appropriations. Sec. 401 of the Act imposed a total appropriation ceiling or $900,000 for the Water Resources Council's administration of the Act. This ceiling is divided by the Act into categories of $500,000 for the Council's administration of Title I, which pertains to the operation of the Council itself, and $400,000 for Title III, state grants program. President Nixon's fiscal year 1972 budget request for these purposes was $1,381,000. Testimony from the Director of the Water Resources Council and executive communications are included. (Tolle-Florida)
W73-03588

WASTE DISPOSAL IN THE COASTAL WATERS OF NEW YORK HARBOR.
For primary bibliographic entry see Field 05G.
W73-03589

WATERSHED DEVELOPMENT PLANS--1969.
For primary bibliographic entry see Field 06B.
W73-03590

AMENDMENTS TO THE COMPACT CREATING THE POTOMAC VALLEY CONSERVANCY DISTRICT AND ESTABLISHING THE INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN.
Hearing--Subcomm. on Rivers and Harbors--Comm. on Public Works, U.S. House of Representatives, November 19, 1969. 63 p.

Descriptors: *Legislation, *Interstate compacts, *River basin commissions, *Potomac River, River basins, Drainage, Sewage wastes, Industrial wastes, Pollution, Effluents, Water resources development, State government, River basin development, Watershed management, Legal aspects, Water resources.

This hearing concerns two resolutions granting the consent of Congress to an amended version of an interstate compact for the Potomac River Basin. Approval would authorize the compact organization to deal with certian other water resources matters in addition to pollution abatement and control. The amended compact provides for federal participation in the administration of the compact, and the proposed resolutions expressly reserve federal rights and jurisdictions over the subject area and the right of Congress to alter, amend, or repeal. The House Joint Resolutions 30 and 319 are included as well as oral testimony and written statements. The Potomac River Sanitation Compact is also included. (Tolle-Florida)
W73-03591

SHORELINE PROTECTION.
For primary bibliographic entry see Field 08D.
W73-03592

SABINE RIVER BASIN COMPREHENSIVE STUDY.
For primary bibliographic entry see Field 06B.
W73-03593

PELL V. NELSON (LIABILITY FOR ALTERATION OF NATURAL FLOW OF SURFACE WATERS).
201 N.W.2d 136-139 (Minn. 1972).

Descriptors: *Minnesota, *Judicial decisions, *Surface runoff, *Drainage systems, *Alteration of flow, Drainage water, Runoff, Farm management, Drainage effects, Legal aspects, Pumps, Drainage basins, Watersheds (Basins), Flooding, Adjacent landowners, Surface waters, Drainage practices, Relative rights, Dikes, Pumps, Base flow, Natural flow doctrine.
Identifiers: Injunction (Prohibitory).

Plaintiff landowners sought to recover damages and to enjoin defendant adjacent landowner from interfering with the natural flow of drainage water. Plaintiffs had undertaken an extensive drainage project to accommodate a watershed by laying tile throughout a 160-acre area and running it into a sump drained by an electric pump. A dike was built by plaintiff to prevent the discharged water from returning to the sump. However, defendant built a dike, returning water inundating his property to plaintiff's property resulting in recycling of drained water through the sump pump contrivance. Defendant counterclaimed, seeking damages and an injunction to prevent plaintiff from diverting and accelerating the natural flow of water over his property. The Minnesota Supreme Court held that a landowner may not collect and divert surface water from its natural channel to discharge it where it would not otherwise have gone. The court held the tile drainage system was reasonable; however, the construction of the dikes by defendant and plaintiff and the operation of the sump pump were enjoined. (Tolle-Florida)
W73-03594

CITY OF ALBANY V. STATE OF NEW YORK (NAVIGABLE WATERCOURSES ARE HIGHWAYS).

335 N.Y.S.2d 975-983 (Ct. Cl. 1972). 9 p.

Descriptors: *New York, *Judicial decisions, *Navigable rivers, *Highways, Legal aspects, Watercourses (Legal aspects), Navigation, Basins, Canals, Legislation, Local governments, State governments, Compensation, Transportation, Eminent domain, Boating.
Identifiers: *Albany (NY).

Plaintiff city sued defendant state for compensation for appropriation of lands. The lands appropriated were part of a basin at the termination of a canal, which the city was statutorily charged to use only for commerce. Until 1954 this basin was used for dockage, wharfing and harboring; between 1954 and 1956 the state filled in the basin in order to construct a highway. Plaintiff contends the state has put the land to a substantially different use and thus it is entitled to compensation. The defendant alleges the city held the land in its governmental capacity rather than its corporate or proprietary capacity and moreover, it is not using the land for a substantially different purpose; therefore, the city is not entitled to compensation. The New York Court of Claims held that the basin could be put to a commercial or public transportation use and thus was navigable and that navigable canals are highways. The Court ruled therefore, that the property was not taken for a substantially different purpose from that for which it was held, and that the city held the basin in its governmental rather than proprietary or corporate capacity. Thus the city was not entitled to compensation. (Brackins-Florida)
W73-03595

RURAL DEVELOPMENT ACT OF 1972.

P.L. 92-419, 86 Stat. 657, 1972 U.S. Code Congressional and Administrative News, p. 3792-3816 25 p.

Descriptors: *Watershed Protection and Flood Prevention Act, *Legislation, *Water quality control, *United States, *Water supply development, Water storage, Water sources, Water management (Applied), Financing, Waste disposal, Governmental interrelations, Government finance, Grants, Municipal water, Pollution abatement, Sewage disposal, Water conservation, Reservoir storage, Reservoir operation, Rural areas, Water pollution control.
Identifiers: *Rural Development Act.

Title I itemizes amendments to the Consolidated Farmers Home Administration Act of 1962. Amendments to the Watershed Protection and Flood Prevention Act are contained in Title II. Included is a provision which allows the Secretary of Agriculture to enter into agreements with landowners for the installation of soil and water conservation practices and for watershed or subwatershed work plans. In return for such practices the Secretary shall agree to share the costs of carrying out those practices and measures which he considers are in the public interest. Also included are provisions for reservoir storage and cost sharing between the federal government and the local agency. Title III contains amendments to the Bnakhead-Jones Farm Tenant Act. Included are provisions allowing the Secretary to provide assistance, financial and technical, for the storage of water for the needs of any rural community water supply. Also included is a section authorizing technical and other assistance for installing measures and other facilities for water quality management, for the control and abatement of agriculture-related pollution and for the disposal of solid wastes. (Tolle-Florida)
W73-03596

PEOPLE V. CONSOLIDATED EDISON CO. (EQUAL PROTECTION UNDER STATE CONSERVATION LAW).

336 N.Y.S.2d 708-709 (Sup. Ct. 1972). 2 p.

Descriptors: *Electric powerplants, *Nuclear powerplants, *New York, *Fishkill, *Penalties (Legal), Judicial decisions, Water law, Legislation, Legal aspects, Nuclear power, Electric power, Facilities. Hydroelectric plants, Hydroelectric power, Bodies of water, Fish, Wildlife conservation, Water cooling, State governments, Fish conservation, Hudson River.

Plaintiff state (New York) sues defendant power company to recover civil penalty for violation of section of State Conservation Law prohibiting taking of fish from body of water by shutting and drawing off water. Defendant's nuclear power plant, to cool condensers, drew water from a river by intake pumps which over a 4-day period killed approximately 130,000 fish by impaling them on wire mesh screens. Defendant contended that based solely on its means of producing power it will not be afforded equal protection of the law as the statute excludes hydroelectric power dams and impoundments. The state alleged the existence of a logical basis for differentiating the means for producing power, since a hydroelectric power dam could be regulated to minimize fish loss, whereas the nuclear power operation effects a continuous fish loss. On cross motions for summary judgment, the New York Supreme Court, Special Term, held that application of the statute against the nuclear power plant while excluding liability to hydroelectric power facilities, was no denial of equal protection of the law. State's motion for summary judgment granted. (Tolle-Florida)
W73-03597

TUCCI V. SALZHAUER (FORESHORE RIGHTS OF THE PUBLIC).
336 N.Y.S.2d 721-724 (App. Div. 1972). 4 p.

Descriptors: *Public access, *Public rights, *New York, *Riparian rights, *Water law, Shores, Riparian land, Legal aspects, Judicial decisions, Riparian waters, Land, High water mark, Low water mark, Navigable waters, Fishing, Boating, Swimming, Recreation, Access routes, Boundaries (Property), Water rights, Harbors, Water, Right-of-way, Easements.
Identifiers: *Foreshore, *Jus publicum, Injunctions (Prohibitory), Coastal waters, Hempstead Harbor, N.Y.

Plaintiff sought to enjoin defendant from: (1) preventing the clearing and making for pedestrain use a right-of-way over defendant's property and (2) from interfering with plaintiff's rights under doctrine of 'jus publicum' to use foreshore land between high and low watermarks in front of defendant's property. Plaintiff averred he had a public right to use the foreshore for fishing, bathing, boating and other lawful purposes, and when the tide was out, the right of access to the water for the same purposes. The New York Supreme Court, Special Term, Nassau County, dismissed the second cause of action and enjoined plaintiff on a counterclaim from reclining and lounging on the foreshore in front of defendant's property, when the tide was out, other than to pass over it as a means of access. The New York Supreme Court, Appellate Division, held that as a member of the public, plaintiff's use of the foreshore for reclining and lounging was consistent with and necessary for the complete enjoyment of his right of access to the harbor waters. Judgment reversed insofar as appealed from, on law; plaintiff granted limited relief on second cause of action; finding of facts affirmed. (Tolle-Florida)
W73-03598

SCHERR V. VOLPE (APPLICATION OF NEPA TO HIGHWAY CONSTRUCTION IN WATERSHED).

466 F.2d 1027-1035 (7th Cir. 1972). 9 p.

Descriptors: *United States, *Judicial decisions, *Highway effects, *Legal review, Administrative decisions, Adjudiciation procedure, Watercourses (Legal aspects), Water law, Legal aspects, Administrative agencies, Legislation, Highways, Water pollution sources, Water pollution control, Decision making, Water quality control.
Identifiers: *National Environmental Policy Act, *Environmental Impact Statements, Injunction (Prohibitory).

Plaintiffs local residents sought an injunction against defendant highway officials to halt construction of a highway. Defendants were widening a federal aid highway to four lanes in an area which had eleven lakes, two major rivers and their watershed and flood plains, and wetlands. No environmental impact statement had been filed which, contended plaintiffs, was a violation of the National Environmental Policy Act of 1969. Defendants averred no impact statement was required because this was not a major federal action significantly affecting the quality of the human environment and therefore the Act was not applicable. The United States Court of Appeals for the Seventh Circuit held that a project involving widening a two-lane highway to a four-lane highway and which would result in damage to wildlife habitats, increased levels of water pollution and impingement of aesthetic natural beauty and recreational value of the area was a major federal action significantly affecting the quality of the human environment and thus the National Environmental Policy Act was applicable. The court granted a preliminary injunction halting construction thereby affirming the District Court. (Brackins-Florida)
W73-03599

AMENDMENT OF FEDERAL WATER POLLUTION CONTROL ACT (S. 2770).

Congressional Record, Vol 118, p S16869-S16895 (daily ed.) Oct 4, 1972. 27 p, 2 tab.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Government finance, *Water pollution control, Permits, Grants, Costs, Federal budget, Law enforcement, Watercourses (Legal aspects), Pollution abatement, Waste disposal, Water pollution sources, Political aspects, Government supports, Waste treatment, Treatment facilities, Cost sharing, Effluents, Water quality control, Sewage sludge, Water quality standards, Thermal pollution, Salt water intrusion.
Identifiers: *Citizen suits, *Federal Water Pollution Control Act Amendments of 1972, National Environmental Policy Act, Dredged spoil disposal, Standing (Legal), Refuse Act of 1899.

This report on the Federal Water Pollution Control Act amendments of 1972 contains an analysis of each significant provision of the legislation. Also included are detailed discussions of various provisions including: section 511 (c), which exempts certain actions taken under this act from compliance with the National Environmental Policy Act; federal funding for the construction of waste treatment facilities; the timing and phases of effluent limitations; enforcement of the act, with remarks on citizens' suits, requirements for a citizens' suit, and the permit program; the effect of this act on pending litigation initiated under the Refuse Act of 1899; and the inclusion of salt water intrusion within the act's definition of pollution. The conference report discussion emphasizes: construction grants for waste treatment facilities, effluent limitations, area waste treatment management requirements, disposal of sewage sludge from waste treatment facilities, the non-mandatory federal enforcement provision, thermal discharges, oil and hazardous substances liability, dredged spoil disposal, ocean dumping, the permit program and citizen suits. (Brackins-Florida)
W73-03600

NATURE AS A POLLUTER,
House, Washington, D.C.
For primary bibliographic entry see Field 04D.
W73-03602

NONPOINT SOURCE POLLUTION FROM AGRICULTURAL, RURAL AND DEVELOPING AREAS,
House, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-03603

THE OCEAN DUMPING BILL,
Senate, Washington, D.C.
W. V. Roth, Jr.
Congressional Record, Vol 118, p S9626 (daily ed.) June 19, 1972. 1 p.

Descriptors: *Waste disposal, *Oceans, *Legislation, *Waste dumps, Radioactive disposal, Environmental engineering, Ultimate disposal, Federal government, Disposal, Industrial wastes, Water pollution, Water pollution sources, Ocean currents, Regulation, Planning, Municipal wastes, Water quality, Water quality control.

The proposed bill which is presently in conference is designed to regulate sewage and industrial waste dumping into the Atlantic, Gulf and Pacific Coasts of the United States by all American Flag Ships and will prohibit foreign ships from taking on cargo in the United States for ocean dumping. Although at present industrial waste is dumped at federal dumping grounds, strong ebb and flow tides periodically carry a putrid plume of pollutants to the coast. The need to move these dumping sites to a distance offshore where coasts are not adversely affected is urgent since many of these wastes are dangerous toxins, arsenic compounds, and various concentrated acid and alkali solutions. It is urged that scientific studies determine the proper offshore dumping distance. (Beardsley-Florida)
W73-03604

WATER SERVICES REORGANISATION IN ENGLAND AND WALES - GOVERNMENT PROPOSALS.
For primary bibliographic entry see Field 05G.
W73-03670

6F. Nonstructural Alternatives

COUNTY OF SACRAMENTO WATER RESOURCES POLICY.
Sacramento County, Calif.

June 19, 1972. 9 p.

Descriptors: *California, *water resources management, *Surface waters, *Groundwater, *Planning, Water demand, Water resources, Water resources development, Flood control, Administration, Water quality.
Identifiers: *Sacramento County, *Water resources policy, *Regional planning.

Realizing that Sacramento county has a large potential source of water if properly developed, the Board of Supervisors have set forth general policy statements to guide this development. Six general policy statements were advanced, namely: (1) the management of the County's water resources must be the responsibility of a single, county-wide governmental entity, (2) the value of the groundwater reservoir must be recognized to assure the best use of this water, (3) surface waters are to be fully utilized to meet general county-wide water needs, (4) the County supports the development and utilization of the best sources available, (5) the County shall continue to provide for water-oriented recreational needs, and (6) the County shall continue to require adequate flood control measures to assure orderly development within the county. In order to achieve these goals, eleven specific policies were advanced, including: (1) a ground water level and quality monitoring program is to be established, (2) water companies, both private and other, shall be consolidated, (3) the American River shall be protected and improved through studies and minimum flow augumentation, (4) flood control projects shall be studied in depth and projects with the federal government supported, and (5) controversial projects will be studied, determining all effects of the project before the County will support or oppose such a project. (Poertner)
W73-03636

6G. Ecologic Impact of Water Development

BIOLOGICAL AND CHEMICAL OBSERVATIONS IN MUMFORD AND PALMER COVES (GROTON, CONN.) SEPTEMBER 1970-SEPTEMBER 1971,
Connecticut Univ., Noank. Marine Research Inst.
J. D. Buck.
Available from National Technical Information Service as PB-213 817, $3.00 in paper copy, $0.95 in microfiche. Final Report to The Connecticut Department of Environmental Protection (Water Resources Commission) 1972. 61p, 16 fig, 5 tab, 23 append. OWRR-A-037-CONN (1), OWRR-14-31-0001-3207.

Descriptors: *Estuarine environment, *Sewage effluents, *Volume, *Pollution abatement, Regulation, Sewage treatment, Freshwater, Flow, Salinity, Sewage bacteria, Nitrates, Phosphates, Phytoplankton, Benthos, Sewage disposal, Monitoring, Treatment facilities, Water pollution control, *Connecticut, Path of Pollutants.
Identifiers: *Saline coves, *Munford Cove (Conn), *Palmer Cove (Conn), *Effluent volume influence, Effluent outfall, Growth stimulation, Fishers Island Sound, Connecticut estuaries.

A chemical and biological study is described for a Connecticut estuary receiving 0.25 MGD of primary-treated sewage effluent prior to construction of a secondary treatment plant with projected flow of 6 MGD. An adjacent, unpolluted cove was used as control. Three stations in each estuary were sampled biweekly from September 1970 to September 1971. Analyses included temperature, salinity, dissolved oxygen, BOD, nitrate, and phosphate. Counts were made of total bacteria, total and fecal coliforms, fecal streptococci, phytoplankton, and benthic invertebrates. Results indicated that nitrate, phosphate, and dissolved oxygen levels at the current outfall area at the head of the receiving cove are occasionally high enough to suggest that the increased flow of fresh water and nutrients into the saline cove may produce adverse effects in terms of stimulating the growth of existing populations of flagellated phytoplankton. While only the effluent mixing area is affected at present, the greatly increased effluent volume projected for the cove will influence a larger area as a function of wind, tides and other factors. The directive by the State of Connecticut Department of Environmental Protection to extend outfall area for the new plant approximately one mile seaward into Fishers Island Sound is considered prudent.
W73-03262

POJOAQUE UNIT, SAN JUAN-CHAMA PROJECT, COLORADO-NEW MEXICO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Amarillo, Tex. Region 5.
For primary bibliographic entry see Field 08D.
W73-03319

NORTH GEORGIA DEVELOPMENT F.P.C. PROJECT NO. 2354 (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Georgia Power Co., Atlanta.
For primary bibliographic entry see Field 04A.
W73-03320

AN OVERVIEW OF INTERNATIONAL ENVIRONMENTAL REGULATION,
Toledo Univ., Ohio. Coll. of Law.
S. A. Bleicher.
Ecology Law Quarterly, Vol 2, p 1-90 1972. 367 ref.

Descriptors: *Environmental effects, *Environmental control, *Resources development, *International law, United Nations, International commission, Ecology, Land resources, Natural resources, Treaties, Legislation, Legal aspects, Administrative agencies, Regulation, Future planning (Projected).
Identifiers: *United Nations Conference on the Human Environment.

Governments are currently taking a piecemeal approach in the classification and analyses of environmental problems. It is essential that a few fundamental organizing concepts be found which can provide a framework for international consideration of these problems. An examination is made of some comprehensive legal principles which can justify effective international regulation of environmentally damaging activities and disruptive national regulatory efforts, and of the features that distinguish environmental problems from other kinds of regulation. Environmental problems are classified as follows: (1) activities physically affecting other states through the medium of shared resources, (2) activities affecting shared resources, and (3) national environmental regulatory activities affecting global wealth production and distribution. Governments must consolidate broad areas of environmental regulation and impose some comprehensive rules upon the patchwork of existing laws. (Reed-Florida)
W73-03330

TOWARD A WORLD ORDER RESPECTFUL OF THE GLOBAL ECOSYSTEM,
Princeton Univ., N.J. Center of International Studies.
R. A. Falk.
Environmental Affairs, Vol 1, p 251-265, 1971. 3 ref.

Descriptors: *International waters, *Water pollution control, *International law, Law of the sea, Foreign trade, Oceans, Navigation, Marine fisheries, Oil pollution, Social aspects, Governments, Foreign countries, International commissions, Social change, Decision making, Water resources development.

National governments are no longer able to solve the most serious problems facing the world such as that posed by the mounting pressures on the global environment. The activities of men and nations in the international realm are virtually free from consistent patterns of regulation. Three premises are set forth to illustrate the nature of the global environmental problem: (1) the premise of excess capacity, (2) the premise of local impact and (3) the premise of compatible use. Several examples of inadquacies of the present world order to cope with environmental problems are also used: overkilling of whales leading to near extinction of some species, pollution of the Danube and Rhine Rivers and ocean pollution. The present order emphasizes competition and self-assertion of sovereign states contrary to the collective good. Competing sovereign states will have to be replaced as prime centers of international decision making in the environmental field. What is needed is an international authority with the power to monitor the environmental condition of the planet, to set pollution standards, to zone international waters and to enforce its own rules and regulations. (Brackins-Florida)
W73-03331

LEADING CREEK CONSERVANCY DISTRICT, WATER SYSTEM PROJECT IN SOUTHEAST OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Economic Development Administration, Chicago, Ill. Midwestern Region.
For primary bibliographic entry see Field 05F.
W73-03350

JACKSONVILLE HARBOR (SECTION 2), NAVIGATION, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 08A.
W73-03351

CARBON HILL WATERSHED, CUSTER COUNTY, MONTANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W73-03352

LAND OUTLEASE FOR WASTEWATER TREATMENT FACILITIES, TYNDALL AIR FORCE BASE, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of the Air Force, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-03353

LONG HOLLOW CREEK CHANNEL CLEARING, NEZ PERCE, IDAHO, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla, Walla, Wash.
For primary bibliographic entry see Field 04A.
W73-03354

PLASMA PROTEIN VARIATION IN A WINTER FLOUNDER (PSEUDOPLEURONECTES AMERICANUS) POPULATION,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
G. Pesch.
Journal Fisheries Research Board of Canada, Vol 27, No 5, p 951-954, 1970. 1 fig, 1 tab, 9 ref. EPA Program 18050 DTX 11/68. NIH ES 41-02 PHS WP-00858.

Descriptors: Fish, *Fish physiology, *Proteins, Electrophoresis, *Gonads, *Sexual maturity, Diseases, Aging, Metabolism, Cytological studies, Osmotic pressure, Hydrogen ion concentration.
Identifiers: *Winter flounder, Pseudopleuronectes americanus, *Plasma protein variation, Cellulose acetate electrophoresis.

Variations in plasma protein of winter flounder were investigated using cellulose acetate electrophoresis. Pattern differences in gonad maturation, sex, disease and age appeared in eighty-eight fish from a single haul. Slow and medium mobility groups were prominent. A fast fraction with more mobility than human albumin was present. The fast fraction in males and the slow fraction in females was responsible for the total concentrations increasing with gonad maturation. A drop in concentration for all fractions was observed in the presence of disease. Concentration increased in the slow and medium fractions with aging but showed no increase in the fast fraction. (Ensign-PAI)
W73-03446

TOWN OF COUSHATTA, FLOOD PREVENTION PROJECT MEASURE, TWIN VALLEY RC AND D PROJECT, LOUISIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-03560

PENN'S LANDING, DELAWARE RIVER, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 04A.
W73-03561

NEW JERSEY SPORTS EXPOSITION AUTHORITY V. MCCRANE (FUTURE ECOLOGICAL DAMAGE NOT TO INVALIDATE SPORTS AND EXPOSITION LAW).
For primary bibliographic entry see Field 06E.
W73-03563

CRESCENT CITY HARBOR NAVIGATION PROJECT, DEL NORTE COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 08A.
W73-03564

BAL HARBOUR, FLORIDA, PARTIAL BEACH RESTORATION, BEACH EROSION CONTROL AND HURRICANE PROTECTION PROJECT, DADE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 08D.

W73-03565

FINANCIAL GRANT ASSISTANCE TO THE CITY OF SANTA ROSA, SONOMA COUNTY, CALIFORNIA, FOR THE PURPOSE OF CONSTRUCTING WATER AND SEWER LINES TO SERVE A 200-ACRE INDUSTRIAL SITE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Economic Development Administration, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-03566

SOURIS-RED-RAINY RIVER BASINS COMMISSION, ANNUAL REPORT, FISCAL 1970.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03567

CLARION RIVER ACID MINE DRAINAGE ABATEMENT PROGRAM, PENNSYLVANIA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 05G.
W73-03569

DEPARTMENT OF DEFENSE ENVIRONMENTAL QUALITY PROGRAM.
Office of the Deputy Assistant Secretary of Defense for Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 06E.
W73-03572

WASTEWATER TREATMENT FACILITIES CONSTRUCTION GRANTS FOR NASSAU AND SUFFOLK COUNTIES, NEW YORK (FINAL ENVIRONMENTAL INPACT STATEMENT).
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 05D.
W73-03573

PROPOSED CONCRETE LINING OF MAIN OUTLET DRAIN, SOUTH GILA VALLEY, COLORADO RIVER FRONT WORK AND LEVEE SYSTEM, ARIZONA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boulder City, Nev. Region 3.
For primary bibliographic entry see Field 08A.
W73-03574

CANYON LAKES PROJECT, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Recreation, Washington, D.C.
For primary bibliographic entry see Field 06B.
W73-03575

ABSTRACTION AND USE OF WATER: A COMPARISON OF LEGAL REGIMES.
Department of Economic and Social Affairs (UN), New York.
For primary bibliographic entry see Field 06E.
W73-03576

SCHERR V. VOLPE (APPLICATION OF NEPA TO HIGHWAY CONSTRUCTION IN WATERSHED).
For primary bibliographic entry see Field 06E.
W73-03599

CONCEPT FOR LONG RANGE, REGIONAL ENVIRONMENTAL PLANNING FOR POPULATION ABSORPTION THROUGH REGIONAL WATER MANAGEMENT,
Smith (Lewis Gordy), Denver, Colo.
For primary bibliographic entry see Field 06B.

W73-03638

MAN'S IMPACT ON THE CLIMATE.

M.I.T. Press: Cambridge , Mass., London, England. 1971. W. H. Matthews, W. W. Kellogg and G. D. Robinson, editors. 594 p. Illus. Pr. $19.50.
Identifiers: Book, *Climates, Impacts, Pollutants, *Effects, Human population.

This book contains detailed scientific and technical information on global environmental problems, and represents the results of a 1 mo. interdisciplinary examination of the global climatic and ecological effects of man's activities sponsored by the Massachusetts Institute of Technology and held during July, 1970 at Williamstown, Massachusetts. Reports that deal with climate and with atmospheric monitoring are reproduced in part 1. Part 2 provides a broad semi-technical view of the factors involved in determining climate and in changing climate and outlines the ways in which man might affect these processes by introducing pollutants into the environment. Mathematical, modeling and monitoring techniques that are necessary to understand the factors influencing climate conditions are introduced in parts 3 and 4. The next 5 sections discuss specific pollutants and their effects on the climate: CO2 and atmospheric heating, particles and turbidity, particles and clouds, contaminants of the upper atmosphere and a nonproblem and a potential problem (O2 depletion and clearing of the Amazon forest). Each section treats the theoretical and empirical evidence available on predicted or observed effects and indicates the monitoring and measurement methods that can be used to increase knowledge in these areas and alert man to his impact on the climate. Monitoring techniques that are applicable to most of these problems are covered in detail.—Copyright 1972, Biological Abstracts, Inc.
W73-03703

07. RESOURCES DATA

7A. Network Design

RAINFALL MEASUREMENT AT TAITA EXPERIMENTAL STATION, NEW ZEALAND: 1--VERTICAL RAINGAUGES,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 02B.
W73-03278

RAINFALL MEASUREMENTS AT TAITA EXPERIMENTAL STATION, NEW ZEALAND: 2--TILTED RAINGAUGES AND VECTOPLUVIOMETERS,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 02B.
W73-03279

QUANTITATIVE METHODS FOR PRELIMINARY DESIGN OF WATER QUALITY SURVEILLANCE SYSTEMS,
Raytheon Company. Portsmouth, Rhode Island, Environmental Systems Center.
For primary bibliographic entry see Field 05A.
W73-03507

REPORT ON COMPREHENSIVE SYSTEM DESIGN FOR WATER QUALITY MANAGEMENT INFORMATION SYSTEM.
Pennsylvania Dept. of Environmental Resources, Harrisburg. Bureau of Sanitary Engineering.
For primary bibliographic entry see Field 05G.
W73-03646

7B. Data Acquisition

BIOLOGY AND CHEMISTRY OF SURFACE FRESHWATER MICROLAYERS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W73-03272

CLIMATOLOGICAL SUMMARIES FOR SELECTED STATIONS IN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
C. W. Crockett.
Available from the National Technical Information Service as PB-213 881, $3.00 in paper copy, $0.95 in microfiche. Virginia Water Resources Research Center, Bulletin 53, June 1972. 163 p. OWRR A-999-VA (14).

Descriptors: *Climatic data, Rain, Snow, Weather data, Freezing, Precipitation (Atmospheric), Data collections, *Virginia.

Climatological information is summarized for 74 weather stations throughout Virginia. A map locates these stations. Data cover the period 1941-1970 in all cases where the record exists. Specific information shown includes: Maximum and minimum temperature, rainfall and snowfall, probability of temperatures below freezing, probability of precipitation, and a Narrative Climatological Summary for each station. (Johnson-Virginia)
W73-03274

A MULTICHANNEL RECORDER FOR HYDROLOGICAL RESEARCH,
Ministry of Works, Christchurch (New Zealand). Water and Soil Div.
For primary bibliographic entry see Field 07C.
W73-03282

METHOD OF PREPARING DRY RESIDUE FROM WATER WITH A LOW MINERAL CONTENT FOR SPECTRAL ANALYSIS,
Akademiya Nauk SSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 02K.
W73-03304

SURFACE CURRENT MEASUREMENTS BY EXPENDABLE PROBES,
Coast Guard, Washington, D.C. Applied Sciences Div.
For primary bibliographic entry see Field 05B.
W73-03417

FEASIBILITY STUDY OF ELECTROMAGNETIC SUBSURFACE PROFILING,
Geophysical Survey Systems, Inc., North Billerica, Mass.
For primary bibliographic entry see Field 08G.
W73-03509

IDENTIFICATION OF POLYCHLORINATED BIPHENYLS IN THE PRESENCE OF DDT-TYPE COMPOUNDS.
National Environmental Research Center, Cincinnati, Ohio. Analytical Quality Control Lab.
For primary bibliographic entry see Field 05A.
W73-03515

A STATE OF THE ART SURVEY OF THE APPLICATIONS OF AERIAL REMOTE SENSING TO COASTAL ENGINEERING,
Clemson Univ., S.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02L.
W73-03523

ARE EXISTING MEASUREMENTS OF PRECIPITATION INPUT TO WATERSHEDS ADEQUATE FOR MANAGEMENT DECISIONS,
Wyoming Univ., Laramie. Water Resources Research Inst.
P. A. Rechard.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 98-106, 1972. 9 fig, 2 tab, 3 ref. NOAA Contract E-149-69 (N) and 1-36055

Descriptors: *Snowfall, *Precipitation gages, *Water equivalent, *Watershed management, *Wyoming, Data collections, Inflow, Meteorology, Snow surveys, Snow management, Winds, Mass curves.
Identifiers: *Snow gage shielding, Snow fences.

In large portions of the western United States, most of the precipitation in the form of snow is accompanied by wind speeds strong enough to cause major errors in the catch by precipitation gages. The errors are large enough in many instances to indicate that existing measurements of snowfall precipitation as an input, or inflow, value to the hydrologic budget are not adequate for many management decisions. The study sites are described and the results of three years of observation are presented and discussed. In general, under windy conditions, an unshielded precipitation gage will catch about one-third to one-half of the standard snowfall, a gage with its orifice protected by an Alter-type shield and its site protected by snow fencing will catch about the equivalent of the standard snowfall. The blow fence design appears to hold considerable promise for site protection. (See also W73-03536) (Woodard-USGS)
W73-03537

DATA ACQUISITION FOR WATER QUALITY MANAGEMENT--AN ANALYSIS OF TRADITIONAL GRAB SAMPLING METHODS,
Iowa State Univ., Ames.
D. H. Vanderholm, and R. C. Ward.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 107-112, 1972. 6 fig, 11 ref.

Descriptors: *Water quality, *Sampling, *Data collections, *Analytical techniques, *Water quality control, Costs, Chemical analysis, Reviews, Evaluation, Water pollution sources, Statistical methods, Mathematical models, Curves.

Methods were developed to evaluate the effectiveness of grab sampling methods in water quality data acquisition. The basic variables evauated were surveillance effectiveness and cost as functions of sampling frequency. Effectiveness was measured by the ability of surveillance systems to detect significant short-term pollution events and to accurately obtain base level data. Simple statistical procedures and mathematical models were used to predict effectiveness. Results and examples of applications are presented. One example includes a secondary sampling network of six stations, two on the main stem of the South Platte River (Colorado-Nebaska) and four on major tributaries. For this analysis the annual mean is considered the important parameter for evaluating trends and for planning purposes. Although individual values are still important in checking cimpliance with stream standards, this analysis was based upon the ability of the system to estimate annual means within certain accuracy limits. Four parameters were used in the evaluation, DO, BOD, pH, and TDS. Necessary sampling frequencies over a range of allowable error levels were calculated and the results plotted. Using an estimated cost of $75.00 per sample, cost-effectiveness data were computed and plotted. (See also W73-03536) (Woodard-USGS)
W73-03538

AN EFFICIENT QUANTITATIVE METHOD FOR SAMPLING THE MEIOBENTHOS,
North Carolina Univ., Chapel Hill. Dept. of Zoology.
E. E. Ruppert.
Limnology and Oceanography, Vol 17, No 14, p 629-631, 1969, 2 fig, 6 ref.

Descriptors: *Water table, *Core drilling, Groundwater, Tidal waters, Cores, Sampling, Intertidal areas.
Identifiers: *Meiofauna, Uhlig seawater ice method, Suction-corer, Subtidal.

A composite method was described for sampling and extracting intertidal and subtidal meiofauna quantitatively from both above and below the water table. Coring-extraction tubes were designed for quantitative sampling with subsequent extraction by the Uhlig seawater ice method. An extraction rack for supporting the tubes was described, along with a modified suction-corer. The modification consisted of a series of holes drilled to allow insertion of the coring extraction tubes at right angles along its length. This change allowed layered subsamples to be collected without disturbing the sediment. (Murphy-Texas)
W73-03674

PRESERVATION AND STORAGE OF WATER SAMPLES FOR TRACE ELEMENT DETERMINATIONS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W73-03733

NEW TECHNIQUE IN ROTARY SHOT DRILLING WITH REVERSED CIRCULATION,
Borehold Construction Contractor (England).
For primary bibliographic entry see Field 08A.
W73-03838

7C. Evaluation, Processing and Publication

A PHYSICS-BASED APPROACH TO HYDROLOGIC RESPONSE MODELING. PHASE I: MODEL DEVELOPMENT,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 02A.
W73-03257

METHODS FOR ROUTING HYDROGRAPHS THROUGH OPEN CHANNELS,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 08B.
W73-03263

A MULTICHANNEL RECORDER FOR HYDROLOGICAL RESEARCH,
Ministry of Works, Christchurch (New Zealand). Water and Soil Div.
J. E. Patterson.
Journal of Hydrology (New Zealand), Vol 11, No 1, p 55-61, 1972. 3 fig, 2 ref.

Descriptors: *Data collections, *Hydrologic data, *Equipment, *Instrumentation, *Gaging stations, Automation, Measurement, Telemetry, Sampling.
Identifiers: *Multichannel data recorders.

A new nine-channel recorder, based on a standard Fischer and Porter analog-to-digital recorder, was developed primarily for hydrological research purposes. It can accept up to nine event inputs or nine analog inputs or combinations of both. The operating speed is relatively slow but should be adequate for hydrological purposes. This machine may find use as part of an automatic climate station for remote areas. The principal advantages are low modification costs and simplicity. (Knapp-USGS)
W73-03282

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 12-16. NORTH PACIFIC SLOPE BASINS, ALASKA, AND HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Washington, D.C.

Available from GPO, Washington, DC 20402, Price $2.00 (paper cover), Geological Survey Water-Supply Paper 2016, 1972. 431 p, 1 fig, 32 ref.

Descriptors: *Water quality, *Surface waters, *Pacific coast region, *Alaska, *Hawaii, Idaho, Montana, Oregon, Washington, Wyoming, Water analysis, Chemical analysis, Inorganic compounds, Organic compounds, Biological properties, Water chemistry, Streams, Sediment transport, Suspended load, Basic data collections.

During the water year ending September 30, 1967, the U.S. Geological Survey maintained 227 stations on 172 streams for study of chemical and physical characteristics of surface water in the North Pacific slope basins, Alaska, and Hawaii and other Pacific areas. Contiguous States in the study are Idaho, Montana, Oregon, Washington, and Wyoming. Samples were collected daily and monthly at 93 of these locations for chemical-quality studies. Samples also were collected less frequently at many other points. Water temperatures were measured continuously at 144 and daily at 30 stations. At chemical-quality stations where data are continuously recorded at the stream site (monitors), the records consist of daily maximum, minimum, and mean values for each constituent measured. Quantities of suspended sediment are reported for 25 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 24 stations. (Woodard-USGS)
W73-03293

WATER RESOURCES DATA FOR TEXAS, 1971: PART 1. SURFACE-WATER RECORDS.
Geological Survey, Austin, Tex.

Geological Survey Basic-Data Report, 1972. 647 p, 1 fig, 3 ref.

Descriptors: *Streamflow, *Flow measurements, *Hydrologic data, *Data collections, *Texas, Surface waters, Streams, Lakes, Reservoirs, Gaging stations, Flow rates, Crest-stage gages, Water levels, Average flow, Low flow, Peak discharge.

Surface-water data for the 1971 water year for Texas include records of streamflow or reservoir storage at gaging stations, partial-record stations, and miscellaneous sites. Records for a few pertinent gaging stations in bordering States also are included. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)
W73-03294

CALCULATION OF COMPONENTS IN THE GROUNDWATER BALANCE (RASCHETY ELEMENTOV BALANSA GRUNTOVYKH VOD),
For primary bibliographic entry see Field 02F.
W73-03295

QUANTITATIVE ESTIMATES OF GROUNDWATER RECHARGE IN THE NORTHERN PRIPYAT' POLES'YE (KOLICHESTVENNAYA OTSENKA PITANIYA GRUNTOVYKH VOD V SEVERNOY CHASTI PRIPYATSKOGO POLES'YA),
Akademiya Navuk BSSR, Minsk. Institut Geokhimii i Geofiziki.
For primary bibliographic entry see Field 02F.
W73-03296

PLANNING OF OPTIMAL URBAN WATER SUPPLY SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 06A.
W73-03399

GEOLOGY OF THE MIDDLETOWN-ODESSA AREA, DELAWARE,
Delaware Geological Survey, Newark.
T. E. Pickett, and N. Spoljaric.
Geologic Map Series, No 2, 1971. 1 sheet, 1 fig, 1 map, 7 ref.

Descriptors: *Geology, *Groundwater resources, *Delaware, *Subsurface mapping, *Geologic mapping, Contours, Geologic formations, Hydrogeology, Aquifers, Cross-sections.
Identifiers: *Middletown-Odessa area (Del).

This map scale 1:24000, uses colors and contours to describe the geology and groundwater resources in the Middletown-Odessa area, Delaware. The deepest rocks in the Middletown-Odessa area are the basement crystalline rocks, probably of Lower Paleozoic age. These rocks are the down-dip continuation of the Piedmont rocks of northern Delaware. The oldest sedimentary rock unit is the Potomac Formation, which was deposited in deltas directly over the basement rocks during Early to Late Cretaceous time. The Potomac Formation is found only in the deep subsurface in the Middletown-Odessa area. After deposition of the nonmarine Potomac Formation, the sea encroached over the Coastal Plain and the Upper Cretaceous Magothy Formation was laid down. The Magothy probably was deposited in a shoreline environment consisting of barrier islands and associated estuaries. The sea rose, covering most of the Coastal Plain. From the time of the deposition of the Magothy Formation until at least Middle Eocene time seas covered most of what is now Delaware. The Rancocas Group, Columbia, Magothy, and Potomac Formations are the principal sources of groundwater. The map shows the recharge area of the Rancocas aquifer. The depths to the various aquifers are shown in the cross section. (Woodard-USGS)
W73-03403

GEOLOGY OF THE CHESAPEAKE AND DELAWARE CANAL AREA, DELAWARE,
Delaware Geological Survey, Newark.
T. E. Pickett.
Geologic Map Series, No 1, 1970. 1 sheet, 1 fig, 1 map, 9 ref.

Descriptors: *Geology, *Groundwater resources, *Geologic mapping, *Subsurface mapping, *Delaware, Geologic formations, Hydrogeology, Aquifers, Contours, Cross-sections.
Identifiers: *Chesapeake and Delaware Canal area (Del).

This map, scale 1:24000, uses colors and contours to describe the geology and groundwater resources in the Chesapeake and Delaware Canal area, Delaware. The oldest Coastal Plain unit in Delaware, the Potomac Formation, was deposited on ancient crystalline rocks of the Basement Complex from the latter part of Early Cretaceous time into Lake Cretaceous time. Streams transported clays and sands from the Appalachians in the northwest and sediments were deposited probably in a deltaic environment in this part of Delaware. The overlying white sands and lignitic black silts of the Magothy Formation are separated from the Potomac Formation by an unconformity. The Magothy indicates the transition from older nonmarine sediments to the later marine deposits. Another small unconformity separates the Magothy from the overlying marine Upper Cretaceous rocks. Magothy sediments were deposited in a shoreline environment containing elements of strand line, barrier island, and lagoonal conditions. Groundwater, principally from the Columbia, Magothy, and Potomac Formations in this area, is an important earth resource. The same Pleistocene channels useful for sand and gravel production are good aquifers. (Woodard-USGS)
W73-03404

GEOTHERMAL RESOURCES, PRESENT AND FUTURE DEMAND FOR POWER, AND LEGISLATION IN THE STATE OF WYOMING,
Wyoming Univ., Laramie. Dept. of Geology.
For primary bibliographic entry see Field 03B.
W73-03432

HYDROGRAPHIC DATA FROM OREGON WATERS, 1971,
Oregon State Univ., Corvallis. School of Science; and Oregon State Univ., Corvallis. Dept. of Oceanography.
B. Wyatt, R. Tomlinson, W. Gilbert, L. Gordon, and D. Barstow.
Available from the National Technical Information Service as AD-746 515, $3.00 in paper copy, $0.95 in microfiche. Data Report 53, Reference 72-14, May 1972. 77 p, 6 tab, 26 ref. NR 083-102 N00014-67-A-0369-0007 NSF GA 12113.

Descriptors: *Oregon, Hydrography, *Data collections, *Salinity, *Oxygen, *Temperature, *Phosphates, *Nitrates, Alkalinity, Silicates, Hydrogen ion concentration, Cruises, Columbia River.

Hydrographic data from Oregon waters were collected. The R/V Yaquina and the R/V Cayuse were used in the survey taking salinity, temperature, oxygen, phosphate and nitrate observations during 17 hydrographic cruises. Alkalinity, pH and silicate measurements were also taken. Cruises were particularly concerned with surveying conditions along a latitudinal track at 44 deg 39.1 min N and studying the Columbia River plume. (Ensign-PAI)
W73-03447

AN INVESTIGATION INTO RECREATIONAL WATER QUALITY, WATER QUALITY CRITERIA DATA BOOK, VOL. 4,
Envirogenics Co., El Monte, Calif.
For primary bibliographic entry see Field 05C.
W73-03503

A COMPARISON OF LYSIMETER-DERIVED POTENTIAL EVAPOTRANSPIRATION WITH COMPUTED VALUES,
Agricultural Research Service, Coshocton, Ohio.
For primary bibliographic entry see Field 02D.
W73-03522

A SURVEY OF THE SUBSURFACE SALINE WATER OF TEXAS, VOLUME I,
Core Labs., Inc., Dallas, Tex.
R. H. Snyder, L. C. Buehrer, W. H. Dorsey, F. O. Bell, and P. Messinger.
Texas Water Development Board Report 157, October 1972. 113 p, 103 fig, 3 tab, 64 ref.

Descriptors: *Saline water, *Groundwater resources, *Texas, *Surveys, Aquifers, Water quality, Salinity, Water analysis, Chemical analysis, Water chemistry, Water utilization, Desalination, Impaired water quality, Water yield, Subsurface investigations, Mapping, Maps, Data collections, Geology, Aquifer characteristics.

Results are presented of an investigation of the major saline aquifers in the State of Texas. Saline water, as defined in this report, is water having more than 3,000 ppm of total dissolved solids. The inventory is to serve as a basic reference to the occurrence and availability of large quantities of subsurface saline water that could be utilized in future desalting operations. The study was conducted in three basic parts: the salinity of the aquifers, the productivity of the aquifers, and the geology of the aquifers. The aquifer salinity inventory consists of a computer listing of total dissolved solids, sorted by formation and depth and listed by counties. The aquifer productivity portion consists of an extensive computer listing of the basic rock properties of porosity and permeability, sorted by depth ranges and by geological formation and listed by counties. The geological portions include the mapping of saline aquifers through the development of structural and isopachous maps, as well as the salinity maps. The basic geological data were obtained from well logs. More than 1,600 wells were correlated and encoded into a computer listing. (Woodard-USGS)
W73-03524

GENERALIZED COMPUTER MODEL TO SIMULATE THE HYDROLOGY OF A STREAM BASIN,
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 02A.
W73-03540

THE ANALYSIS AND APPLICATION OF A DIGITALLY SIMULATED ELECTRONIC WATERSHED ANALOG,
Arizona Univ., Tuscon. Dept. of Watershed Management.
R. M. Tinlin, and J. L. Thames.
In: Watersheds in transition; Proceedings of Symposium held at Fort Collins, Colorado, June 19-22, 1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 138-144, 1972. 13 fig, 11 ref.

Descriptors: *Hydrologic systems, *Watersheds (Basins), *Analog models, *Digital computers, Systems analysis, Input-output analysis, Hydrologic data, Runoff, Infiltration, Surface waters, Groundwater movement, Water storage, Water yield, Forecasting, Forest watersheds.

A digitally simulated electronic watershed analog has been developed for the analysis of the hydrologic regime of a watershed. Individual electrical circuits were designed to synthesize the physical characteristics of the hydrologic components of a watershed: interception, surface storage, runoff, infiltration, and subsurface storage. These circuits were related to pertinent empirical studies of significance to each component. Electrical circuit analogies have fallen into disuse due to the inflexibility of fixed component networks. A digital simulation program developed by the electrical engineering profession to provide flexibility in the design of electronic circuitry was adapted for the simulation of the electronic watershed analog. The typical digital circuit analysis program is 'canned' and the user need not understand its intricacies. Input is in the form of circuit parameters on punched cards. The output is in numeric or graphic form. Using digital simulation methodology, the electronic watershed analog was used to analyze a 1.63 acre forested watershed. (See also W73-03536) (Woodard-USGS)
W73-03541

RADIOACTIVITY OF LAKE MICHIGAN, AUGUST-SEPTEMBER 1970.
Environmental Protection Agency, Washington, D.C. Office of Water Programs.
For primary bibliographic entry see Field 05A.
W73-03601

HARMONIC ANALYSIS OF THE PRECIPITATION IN THE ATLANTIC WATERSHED IN COSTA RICA (IN SPANISH),
Servicio Agricola Interamericano, San Jose (Costa Rica). Departamento de Investigaciones.
For primary bibliographic entry see Field 02B.
W73-03697

THE NATURAL ENVIRONMENT OF THE IVORY COAST: IL MAPS. (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
J. M. Avenard, M. Eldin, G. Girard, J. Sircoulon, and P. Touchbeuf.
Mem Orstom (OFF Rech Sci Tech Outr-Mer). 50 (Part 2), 1971, Illus.
Identifiers: Climate, *Environment, *Ivory-Coast, *Maps, Soils, Vegetation.

A series of 12 maps supplementing a comprehensive study on the natural environment of the Ivory Coast is presented: 4 maps on the climate (rainfall, water deficits, hydrographic and hydrometric network), 4 on the vegetation, and 4 on the soil composition.--Copyright 1972, Biological Abstracts, Inc.
W73-03726

CLIMATIC FLUCTUATIONS IN EUROPE BETWEEN THE 13TH AND 20TH CENTURIES AND THEIR REPERCUSSIONS ON THE FAUNA, (IN RUMANIAN),
Academia R. S. R., Cluj. Institutul de Spelologie.
For primary bibliographic entry see Field 02B.
W73-03732

A COMPILATION OF THE AVERAGE DEPTHS OF LAKE MICHIGAN AND LAKE ONTARIO ON A TWO-MINUTE GRID,
Argonne National Lab., Ill.
T. H. Hughes, G. E. Birchfield, and M. T. Matthies.
Available from NTIS, Springfield, Va 22151 Price $3.00 printed copy; $0.95 microfiche. Argonne National Laboratory Engineering Sciences Report ANL/ES-10, January 1972. 94 p, 7 fig, 4 tab, 6 ref, 2 append. NSF Grant GA-25992.

Descriptors: *Depth, *Bathymetry, *Lake Michigan, *Lake Ontario, *Lake morphology, Lake morphometry, Contours, Fathometers, Sounding, Data collections.
Identifiers: Isobaths, 2-minute grids.

Average depths for Lake Michigan and Lake Ontario are estimated at each 2 minutes of latitude and 2 minutes of longitude. Sounding data are used from the navigation charts and field sheets of the U.S. Corps of Engineers and the Canadian Hydrographic Office. The average at a point is taken to be the arithmetic mean of all soundings appearing in a circle of radius one minute of latitude centered at the point without consideration of the sounding's position relative to the point. For those locations with fewer than three soundings in such a circle, the circle is enlarged until three soundings appear within the circle. Final tabulation of the averages with contours is in blocks 30 minutes latitude by 30 minutes longitude. (Woodard-USGS)
W73-03735

HYDROLOGY--FULTON COUNTY, NEW YORK,
Fulton County Planning Dept., Johnstown, N.Y.
H. W. Fear.
Available from NTIS, Springfield, Va 22151 Price $3.00 printed copy; $0.95 microfiche. Report, August 1972. 37 p, 20 fig, 10 tab.

Descriptors: *Hydrologic data, *Precipitation (Atmospheric), *Runoff, *New York, Streamflow, Flow rates, Hydrographs, Correlation analysis, Temperature, Snowmelt, Storms, Hydrology.
Identifiers: *Fulton County (N.Y.).

Precipitation and runoff data are presented for Fulton County, New York. The long-term average of annual precipitation over the county, as represented by the record at Gloversville, is about 43 inches. Tables, together with isopleth maps and bar graphs, present the picture of precipitation at 14 sites in or adjacent to the county. Latent water in snow accumulations (water content) increases during the winter months until it reaches about 30% of the depth of the snow measured in inches. Warm temperature and spring showers help melt the snow and add to the flow of streams to increase the flood hazard. Comparisons of runoff of Sacandaga River and East Canada Creek show the well defined similarity of high uncontrolled flows. (See also W73-03737) (Woodard-USGS)
W73-03736

SNOW RESOURCES--FULTON COUNTY, NEW YORK,
Fulton County Planning Dept., Johnstown, N.Y.
H. W. Fear.
Available from NTIS, Springfield, Va 22151 Price $3.00 printed copy; $0.95 microfiche. Report, August 1972. 57 p, 64 fig, 10 tab. HUD-NYP-246.

Descriptors: *Snow surveys, *Snow cover, *Water equivalent, *Snow management, *New York, Snowmelt, Melt water, Runoff, Data collections, Flood control.
Identifiers: *Fulton County (N. Y.).

Snow on the ground and the respective water content are surveyed at 19 sites in Fulton and adjacent counties in New York. The depth of the snowpack and its corresponding water content have been compiled for each of the 19 sites for each year of the 8-year period, 1965-1972, and appear in tables and graphs. The average snow cover over the county during the 1965 winter was only 14.4 inches with a water-content of 4.26 inches, whereas in 1971, the snow depth averaged 39.0 inches (3.25 feet) and the latent water (snowmelt) amounted to 12.76 inches. The respective densities of snow in these years were 29.6% and 32.7%. Near the end of winter every year, the probable water content of the snow on the ground is slightly more than 30%. It is important to consider this potential flood water for the protection of flood-plain areas. (See also W73-03736) (Woodard-USGS)
W73-03737

STRUCTURAL ANALYSIS OF HYDROLOGIC TIME SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W73-03738

LOW FLOWS AND TEMPERATURES OF STREAMS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 04C.
W73-03739

EMERGENCY GROUND-WATER SUPPLIES IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 04B.
W73-03740

PREDICTING IRRIGATIONS FROM CLIMATIC DATA AND SOIL PARAMETERS,
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 03F.
W73-03789

08. ENGINEERING WORKS

8A. Structures

PRACTICAL DETERMINATION OF THE STRESSES IN A SOIL SUPPORTING A LOAD OF GREAT LENGTH,
Grenoble Univ. (France).
For primary bibliographic entry see Field 08D.
W73-03309

POJOAQUE UNIT, SAN JUAN-CHAMA PROJECT, COLORADO-NEW MEXICO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Amarillo, Tex. Region 5.
For primary bibliographic entry see Field 08D.
W73-03319

DAMS-INSPECTION-SECRETARY OF ARMY.
For primary bibliographic entry see Field 06E.
W73-03345

DAMS--INSPECTION--SECRETARY OF ARMY--LEGISLATIVE HISTORY.
For primary bibliographic entry see Field 06E.
W73-03346

LEADING CREEK CONSERVANCY DISTRICT, WATER SYSTEM PROJECT IN SOUTHEAST OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Economic Development Administration, Chicago, Ill. Midwestern Region.
For primary bibliographic entry see Field 05F.
W73-03350

JACKSONVILLE HARBOR (SECTION 2), NAVIGATION, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from the National Technical Information Service as EIS-FL-72-4826-F, $6.75 in paper copy, $0.95 in microfiche. July 3, 1972. 91 p, 2 map, 7 tab, append.

Descriptors: *Environmental effects, *Florida, *Harbors, *Dredging, Turbidity, Channel improvement, Permits, Ships, Navigable waters, Silting, Transportation, Recreation, Spoil banks, Estuaries, Aquifers, Tides, Aquatic animals, Rivers, Effluents, Natural resources, Commercial fishing, Port authorities, Economics.
Identifiers: *Environmental Impact Statements, *Jacksonville Harbor (Fla), *St. Johns River, Jacksonville Port Authority.

The project involves deepening an 11-mile reach of the existing St. Johns River channel from Blount Island to the municipal terminals to a depth of 38 feet with widths from 400 to 1200 feet. About 5,000,000 cubic yards of material will be dredged from the existing river channel and placed in 11 construction disposal areas comprising 905 acres of upland and 108 acres of open water. Adverse environmental effects include turbidities in the area during dredging and some siltation. Fish and shrimp, particularly the young or larvae may also be adversely affected. There will be a displacement of wildlife and temporary loss of vegetation in the upland disposal areas. Alternative methods of disposal, such as hauling out to sea and locating the loading facilities at the mouth of the river were evaluated and found to be uneconomic, disruptive

to present installations and future plans of the community. Anticipated industrial growth and resulting population increase will occur independently of the project, although the project undoubtedly will spur long-term economic growth. There have been public hearings and interstate agencies have been contacted for comment. (Tolle-Florida)
W73-03351

LAND OUTLEASE FOR WASTEWATER TREATMENT FACILITIES, TYNDALL AIR FORCE BASE, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of the Air Force, Washington, D.C.
For primary bibliographic entry see Field 05D.
W73-03353

HARDWICKE V. UNITED STATES (PROPERTY VALUATION MUST CONSIDER POSSIBLE DETRIMENT DUE TO DIVERSION DAM).
For primary bibliographic entry see Field 06E.
W73-03358

TOWN OF COUSHATTA, FLOOD PREVENTION PROJECT MEASURE, TWIN VALLEY RC AND D PROJECT, LOUISIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as EIS-LA-72-4718-F, $4.25, in paper copy, $0.95 in microfiche. June 16, 1972. 44 p, 2 map, 3 illus, 2 tab.

Descriptors: *Louisiana, *Environmental effects, *Flood control, *Channeling, Flood protection, Water control, Floods, Overfalls, Turbidity, Flood control, Erosion control, Land use, Water management (Applied), Flood damage, Area redevelopment, Wildlife habitats, Diversion structures.
Identifiers: *Coushatta (Louisiana), *Environmental Impact Statements.

This project consists of the construction of about seven and six tenths miles of flood prevention channels with the installation of appurtenant structures for water control including recessed inlets and erosion control structures such as pipe drops and overfalls, and plunge basins for protection of the channels. The project will be located on about 3,300 acres of land in the town of Coushatta, Louisiana and part of Ward One, Red River Parish. Favorable environmental effects include a 63 per cent reduction in flood damages, creation of a 200-acre wetland habitat and enhancement of urban land for expansion and growth. Adverse environmental effects include the inundation of about twenty acres of woodland and five acres of pastureland resulting in a loss of wildlife habitats and forests and temporary turbid condition in the channels during construction. Alternatives considered included floodwater retarding structures, reduced channel size and number of channels, flood plain management and no action. Comments from interested sources are included. (Brackins-Florida)
W73-03560

PENN'S LANDING, DELAWARE RIVER, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 04A.
W73-03561

CRESCENT CITY HARBOR NAVIGATION PROJECT, DEL NORTE COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.

Available from the National Technical Information Service as PB-204 380F, $3.00 in paper copy, $0.95 in microfiche. March 15, 1972. 50 p, 1 plate, 4 tab.

Descriptors: *California, *Harbors, *Breakwaters, *Channel improvement, *Dredging, Coastal engineering, Coastal structures, Engineering structures, Inland waterways, Excavation, Navigation, Port authorities, Transportation, Rock excavation, Explosions, Water pollution effects, Turbidity, Aquatic habitats, Benthos. Environmental effects.
Identifiers: *Environmental Impact Statements, *Del Norte County (Calif).

This project involves the improvement of the inner harbor basin at Crescent City Harbor, California, to reduce vessel damage and delays in use of commercial fishing boats and oil barges. The project consists of a 400-foot extension to the existing inner breakwater and a 20-foot deep inner harbor that is 200 feet wide at the breakwater entrance and widens to 300 feet along the shoreward side of the inner breakwater. Later the 20-foot deep inner harbor will be expanded to provide access to Citizen's Dock. Crescent City Harbor Commissioners have assured federal authorities that the following will be fulfilled with respect to the project: a 30-foot-wide berthing area by oil terminals company; all lands, easements, and right-of-way for the project's completion; and regulations concerning discharge of pollutants in harbor water. The project will destroy the existing benthic population. However, the dock environment furnished by the breakwater will afford an improved marine habitat over the existing bottom conditions. Natural reseeding from adjacent undisturbed areas will quickly replenish organisms in the affected area. Proper scheduling can reduce the effects of blasting rock formations on the local fish life. Dredging will cause temporary turbidity and the spoil will be placed in authorized areas. Other alternatives are not considered as feasible as the instant project. (Beardsley-Florida)
W73-03564

FINANCIAL GRANT ASSISTANCE TO THE CITY OF SANTA ROSA, SONOMA COUNTY, CALIFORNIA, FOR THE PURPOSE OF CONSTRUCTING WATER AND SEWER LINES TO SERVE A 200-ACRE INDUSTRIAL SITE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Economic Development Administration, Washington, D.C.

Available from the National Technical Information Service as EIS-CA-72-4705-F, $5.25, in paper copy, $0.95 in microfiche. June 14, 1972. 65 p, 5 map, 3 tab, 1 chart.

Descriptors: *Environmental effects, *Washington, *Sewerage, *Water distribution (Applied), Sewers, Sewage treatment, Conveyance structures, Pipes, Disposal, Hydraulic structures, Water delivery, Teamster, Water works, Distribution systems, Distribution, Consumptive use, Pipelines, Conduits, Claypipes.
Identifiers: *Environmental Impact Statements, *Santa Rosa (Calif).

This project will provide for a complete sewer collection and water distribution system to serve a 200-acre industrial site in Santa Rosa, California. The sewer lines range from 12 to 36 in. in diameter and the water line is 12 in. in diameter. The operation of the plant will directly reduce the high rate of unemployment in the Santa Rosa area which has been designated an economic development act redevelopment area. A secondary effect of the project will be to enable the city to move ahead with plans to develop new commercial and residential areas over a 15-year period. Adverse effects from the overall plan include increased concentrations of people, auto emissions and activities caused by construction. Other sections of Santa Rosa considered for the project are not as feasible as the instant project. Included are comments from interested government agencies. (Beardsley-Florida)
W73-03566

PROPOSED CONCRETE LINING OF MAIN OUTLET DRAIN, SOUTH GILA VALLEY, COLORADO RIVER FRONT WORK AND LEVEE SYSTEM, ARIZONA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boulder City, Nev. Region 3.

Available from the National Technical Information Service as EIS-AZ-72-5029-F, $5.50 in paper copy, $0.95 in microfiche. August 3, 1972. 58 p, 2 map, 2 photo.

Descriptors: *Concrete-lined canals, *Environmental effects, *Arizona, *Salt balance, *Drainage water, Water quality, Saline water, Water quality control, Environmental engineering, Spoil banks, Groundwater, Spawning, Flood plains, Topography, Soil conservation, Mexico.
Identifiers: *Environmental Impact Statements, *South Gila Valley (Ariz).

The proposed project, located in Yuma County, Arizona, is designed to prevent the seepage of saline water from the Main Outlet Drain into the Gila River Pilot Channel and the ground-water table of South Gila Valley by lining the 8-mile-long Main Outlet Drain with concrete. Stopping saline water seepage will improve the quality of water delivered to Mexico and will eliminate deterioration of groundwater in South Gila Valley. Present spoil banks will be eliminated and the drainage channel will be narrowed, increasing land availability. There will be a temporary adverse effect on spawning habits of fish presently using the unlined drain, but little adverse effect on recreation or wildlife programs in the Gila River floodway area. Additional fill material from sparsely vegetated areas of the Gila River flood plain must be obtained for construction. Drainage water will be bypassed into a portion of the Gila River Pilot Channel during construction. Alternatives considered include: (1) no construction, (2) construction of a new concrete-lined drain north of the South Gila Levee, and (3) construction of a new concrete-lined drain south of the existing unlined drain. Comments from interested sources are included. (Tolle-Florida)
W73-03574

O'NEILL UNIT, MISSOURI RIVER BASIN PROJECT, NEBRASKA.

Hearing--Subcomm. on Irrigation and Reclamation--Comm. on Interior and Insular Affairs, U.S. House of Representatives, March 20, 1972. 131 p, 5 tab.

Descriptors: *Nebraska, *Missouri River, *River basin development, *Reservoir operation, *Irrigation, Environmental effects, Reclamation, Dams, Fish, Wildlife habitats, Recreation, Reservoirs, Flood control, Water supply, Agriculture, Vegetation, Water resources development, Watershed management, River basin commissions, Flow control, Legal aspects, Water law.

H.R. 868 authorizes the Secretary of the Interior to construct the O'Neill unit as part of the Missouri River Basin project. The reauthorization of the unit within that project will allow irrigation of 77,000 acres of land and provide flood control for the Niobrara River Valley. The Department of Interior submitted an amendment to the proposed legislation requiring the unit to be operated in a manner which would provide minimum downstream flows thus maintaining the aquarian and riparian environment. The principal features of the unit include a dam and reservoir and 362

miles of canals and laterals. The Assistant Secretary for Water and Power Resources, Department of the Interior, testified in support of the bill and noted that the adverse environmental effects involved in the conversion of 19 miles of Niobrara River into a reservoir would result in some loss of stream fishery and wildlife habitat. A representative of the North Central Nebraska Reclamation District stressed the wildlife and vegetative enhancement of the area. However, a letter from the local Sierra Club stated that the project is economically unsound and ruinous to the environment. (Bradley-Florida)
W73-03584

POLECAT BENCH UNIT, PICK-SLOAN MISSOURI BASIN PROGRAM, WYOMING.
Hearing--Subcomm. on Irrigation and Reclamation--Comm. on Interior and Insular Affairs, U.S. House of Representatives, September 23, 1972. 79 p, 2 tab.

Descriptors: *Wyoming, *Irrigation, *River basin development, *Water supply development, Environmental effects, Dams, Reservoirs, Water resources, Fish, Wildlife, Water supply, Water storage, Municipal water, Irrigable land, Structures, Return flow, Canals, Sediments, Discharge (Water), Recreation, Agriculture, Soils, Reclamation.
Identifiers: *Missouri River Basin Project.

H.R. 1554 seeks authorization for the construction of facilities, including a dam and reservoir, in the Polecat Bench area of Wyoming. The purpose of the bill is to provide irrigation to 19,200 acres of land. The Wyoming Game and Fish Commission reported that no substantial adverse effect on fish and wildlife would result from construction of these facilities. A statement critical of the relatively low cost-benefit evaluation placed on this project and the limited assistance Wyoming has received from the Missouri River Basin Fund was submitted. The Wyoming Democratic National Committeeman also spoke in support of the bill and noted that an important element in the proposed development involved the provisions for additional water supply to meet municipal needs of the city of Powell, Wyoming. The director of parks and recreation for Powell urged the Committee to consider the recreational opportunities afforded by the project. Citizen participation in the hearings was directed almost entirely in support of the project. The decline in the farming population as well as the need for area development of grazing and farming was the most frequently cited reason for urging the bill's approval. (Bradley-Florida)
W73-03585

NORTH LOUP DIVISION, MISSOURI RIVER BASIN PROJECT, NEBRASKA.

Hearings--Subcomm. on Irrigation and Reclamation--Comm. on Interior and Insular Affairs, U.S. House of Representatives, March 21, 1972. 130 p, 4 tab.

Descriptors: *Nebraska, *River basin development, *Irrigation, *Missouri River, *Flow control, Agriculture, Water supply, Flow, Dams, Reservoirs, Canals, Groundwater, Surface water, Wildlife, Fish, Recreation, Reclamation, Recharge wells, Water utilization, Water users, Legal aspects, Legislation, Diversion structures, Watershed management.
Identifiers: *Congressional hearings.

H.R. 869 seeks authorization for the construction of the North Loup division of the Missouri River Basin project in Nebraska. The purpose of the project, which includes two dams and reservoirs with diversion works, is land irrigation. The proposed bill eliminates the objections of some local groups concerning water flows during summer months with the attendant deterioration of downstream environmental conditions. The Director of Agriculture for Nebraska spoke in support of the bill because the state's water supply needs would be balanced with the soil needs for agriculture. His observation was that the project was meritorious both from an environmental as well as agricultural perspective. Opposition was expressed by local citizens who contended that present water flows and groundwater levels were constant and that the geological conditions were not conducive to gravity irrigation. Conflict of interest between cattle ranchers and corn growers was apparent from the statements filed by citizen groups and individuals. Environmental opposition was concerned primarily with alterations in the scenic surroundings and recreational opportunities which some opponents felt would be sacrificed by the project. (Bradley-Florida)
W73-03586

THE CHESAPEAKE AND DELAWARE CANAL.

Hearings--Comm. on Public Works, U.S. House of Representatives, 91st Cong, 2nd Sess, April 7, 8, May 21, 1970. 322 p, 21 fig, 12 plate, 5 map, 16 photo, 5 tab, 9 chart.

Descriptors: *Legislation, *Channeling, *Chesapeake Bay, *Delaware River, *Navigation, *Dredging, Ships, Canals, Cost-benefit ratios, Ecosystem, Estuaries, Hydraulic similitude, Navigable rivers, Salinity, Fish, Hydrographs, Chesapeake Bay, Civil engineering, Siltation, Shellfish, Flow rates, Hydraulic structures, Transportation, Legal aspects.
Identifiers: *Susquehanna River, Salt wedge estuaries.

At the time of this hearing, the Chesapeake and Delaware Canal had been enlarged to the point of seventy-seven per cent completion. The project was adopted by Congress in 1935, and modified, in the Rivers and Harbors Act of 1954, providing for a channel 35 feet deep and 450 feet wide connecting the Delaware River and the Port of Philadelphia with Chesapeake Bay and the ports of Baltimore and Norfolk. A comprehensive estuarine study was established in 1965 with the Secretary of the Army constructing, operating and maintaining a hydraulic model of the Chesapeake Bay Basin and an associated technical center. The testimony at the hearing contrasted the economic against the ecologic aspects of the project. Salinity changes due to tidal flows and the adverse environmental impacts this would have on the Chesapeake Bay estuarine ecosystem were discussed. A description of the Chesapeake Bay study and hydraulic model prepared by the Baltimore district, Corps of Engineers was inserted into the record. (Tolle-Florida)
W73-03587

KOHAKOHAU DAM ENGINEERING FEASIBILITY.
Parsons Brinckerhoff-Hirota Associates, Honolulu, Hawaii.

Hawaii Department of Land and Natural Resources, Honolulu, February 2, 1970. 53 p, 16 fig, 2 tab, 6 ref.

Descriptors: *Feasibility studies, *Dam construction, *Planning, *Hawaii, Engineering evaluation, Water demand, Water resources development, Construction costs.

The feasibility and costs were determined of constructing a dam on the Kohakohau Stream. The dam is needed to meet future water demands in the South Kohala District in the northwestern corner of the Island of Hawaii. Six damsites were chosen and subjected to detailed investigation. A comprehensive evaluation of dam-fill volume and reservoir storage limited the choices to two sites. Final damsite selection was based on further evaluations and comparisons with respect to geology, hydrology, site suitability, availability of construction materials and storage provided. Two methods of development were studied: a two-stage development to provide an initial 5 mgd followed by further development to 10 mgd, and a single stage development to the final capacity of 10 mgd. Costs were as follows: (1) two-stage plan, part 1-$ 5,952,000, part 2-$ 9,511,000; (2) single stage plan-$ 14,255,000, or $ 1,208,000 less than the cost of the two-stage plan. The total plan was described as completely feasible, with a total active storage of 1,780 million gallons, a dam height of 205 feet, with the dam made of rock fill covered with a reinforced concrete surface membrane. Flood control will also be designed into the facility. (Poertner)
W73-03642

ENVIRONMENTAL ENGINEERING INVESTIGATION OF UNDERGROUND FORCE MAINS, CORROSION SURVEY AND PIPE MATERIAL ANALYSIS ON A DESIGN LIFE BASIS.
Murphy Engineering, Inc., Chicago, Ill.
For primary bibliographic entry see Field 05D.
W73-03648

LOSS OF STANDING WATER BY SEEPAGE HALTED WITH FLEXIBLE LINERS.
For primary bibliographic entry see Field 04A.
W73-03769

THE USE OF NEAR-BIT STABILIZER-SUB ASSEMBLIES FOR THE CONTROL OF HOLE DEVIATION,
Reed Roller Bit Co., Odessa, Tex.
C. Wiley.
American Petroleum Institute Drilling and Production Practice, p 66-75, 1965. 20 fig, 6 ref.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, *Boreholes, *Stabilization, Deflection, Data collections, Oil industry.
Identifiers: *Hole deviation, Drill collars, Doglegs, Drill bits.

The application of a new tool, designed in accordance with 'packed-hole' principles, is reported to practically and economically eliminate doglegs and effectively minimize the rate of change in hole deviation. Additional functions such as the elimination of undersized spiral holes and ledges are discussed. The beneficial effect on rock-bit life is noted. The possibility that the assembly creates a 'self-compensating' effect actually tending toward straightening hole, while simultaneously performing the other beneficial functions, is considered. Advantages and disadvantages of the near-bit stabilizer-sub assembly are pointed out and examined. Actual field performance in several areas is presented and the economic advantages of the assembly are illustrated. (Smith-NWWA)
W73-03823

THE DEVELOPMENT OF TECHNIQUES AND EQUIPMENT FOR DEEPER U.S. MINERAL EXPLORATION,
A. S. Johnson.
In: Proceedings of 12th Symposium on Exploration Drilling, University of Minnesota, School of Mineral and Metallurgical Engineering, Minneapolis, Minnesota, p 229-242, October 1967. 3 fig, 2 illus.

Descriptors: Drilling, *Rotary drilling, *Core drilling, *Exploration, *Mineral industry, *Drilling equipment, Drilling fluids, Economics, Drilling samples, Hydraulics.
Identifiers: Diamond drilling, *Drilling programs.

In anticipation of future conditions in mineral prospecting, i.e., coring and exploration drilling to

increasingly greater depths, techniques and equipment are suggested to solve problems brought about by these future conditions. The use of a wider kerf bit to increase the cross-sectional area of the annulus and relieve pressure due to friction will allow greater volumes of fluid to be circulated, maintaining a clean hole. The use of muds as opposed to water as the circulating medium is projected to increase. A trend toward automatic instruments to replace the driller's 'feel' is anticipated, along with a revamping of drilling crews and hours. The rotary drill rig is expected to replace the diamond core drill in upper (0-3000 ft.) sections of an exploratory hole. Larger rigs than those presently in use are anticipated. Stronger tool joints to prevent twist-offs will be mandatory. A comparison of rotary rig and diamond core drill economics is given, showing the rotary rig to be the more economical for deeper exploration work. (Smith-NWWA)
W73-03828

METER FOR MEASURING FLOW DISCHARGE FROM PIPES,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 08G.
W73-03835

NEW TECHNIQUE IN ROTARY SHOT DRILLING WITH REVERSED CIRCULATION,
Borehold Construction Contractor (England).
H. R. Hill.
Water and Water Engineering, Vol 70, No 843, p 195-199, May, 1966. 2 fig.

Descriptors: Drilling, *Rotary drilling, *Coring, Sampling, Drilling fluids, *Patents, *Drilling equipment.
Identifiers: Reverse circulation, *Chilled-shot rotary drilling.

The drilling of water wells by chilled shot rotary methods including the use of forward and reverse circulation is described. Outstanding advantages of the reverse-circulation technique presented over the standard forward-circulation technique are lower water requirements, clean top conditons, better sampling, more precise driller's control, simplification of shot feeding, removal of all core wasting debris, higher penetration rates, etc. (Campbell-NWWA)
W73-03838

WATER WELL MANUAL,
Ministry of Works and Hydraulics, Georgetown (Guyana).
For primary bibliographic entry see Field 08B.
W73-03840

MAXIMUM PERMISSIBLE DOG-LEGS IN ROTARY BOREHOLES,
Pan American Petroleum Corp., Tulsa, Okla.
A. Lubinski.
Transactions, Society of Petroleum Engineers of AIME, Vol 222, p 251-270, 1961. 7 ref.

Descriptors: *Rotary drilling, Drilling equipment, Fatigue (Mechanics), *Boreholes, Drilling.
Identifiers: *Dog-legs, Keyseats, Tool joints.

In drilling operations, attention generally is given to hole angles rather than to change of angle, in spite of the fact that the latter is responsible for drilling and production troubles. Means are presented for specifying maximum permissible changes of hole angle to insure a trouble-free hole, using a minimum amount of surveys. It is expected that these techniques will result in a decrease in drilling costs. (Campbell-NWWA)
W73-03844

REPORTS, HYDROLOGY, 1943, APPENDIX C -- REPORT ON RESEARCH IN THE FIELD OF GROUND WATER BEING CONDUCTED BY OIL COMPANIES,
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 04B.
W73-03845

SHALLOW WATER WELLS IN COASTAL AREAS,
Civil Engineer Corps, Port Hueneme, Calif.
P. Oliver, Jr., and E. D. Michael.
The Military Engineer, Vol 60, No 398, p 409-411, 1968. 3 fig.

Descriptors: *Water wells, Wellpoints, *Shallow wells, *Coastal plains, *Sand aquifers, Dug wells, Gravels, Infiltration galleries, Construction, Construction materials, Well spacing, Hydraulics, Saline water intrusion, Saline water-freshwater interfaces.
Identifiers: Gravel packing.

Sands in coastal areas can provide an economical supply of ground water from shallow depths. Under typical conditions, excavated wells with diameters of 15 to 25 feet and depths as great as 15 feet below static level can produce 80 gallons per minute or more. For low demands, this wide diameter shallow well is superior to the deep drilled well in coastal deposits because of lower construction and maintenance costs, plus the fact that it can be designed to avoid salt water intrusion, and can tap more of the available supply. Infiltration galleries are superior to wide-diameter wells for demands exceeding 250,000 gallons per day. (Smith-NWWA)
W73-03846

8B. Hydraulics

METHODS FOR ROUTING HYDROGRAPHS THROUGH OPEN CHANNELS,
Minnesota Univ., Minneapolis. Water Resources Research Center.
C. E. Rice, and C. L. Larson.
Available from the National Technical Information Service as PB-213 801, $3.00 in paper copy, $0.95 in microfiche. Bull 51, June 1972. 121 p, 21 tab, 44 fig, 36 ref. OWRR A-023-Minn (3).

Descriptors: *Flood routing, *Model studies, *Peak Discharge, Digital Computer, Minnesota, Hydrographs, *Open channel flow, *Simulation analysis.
Identifiers: *Muskingum Method, *Puls Method, Kinematic Wave Method, Ungaged Streams.

A simulation model of an open channel system was used to evaluate some existing flood routing methods, observe the effect of different physical variables on flood wave movement, and to develop a simple routing method. The physical, geometric, and hydraulic components of the model were patterned after real-life conditions common to southeastern Minnesota. The dynamic equations of unsteady flow were used to route flood hydrographs through the channel system and outflow hydrographs were generated to achieve the objectives. The method of characteristics with a specified time interval was used to solve the unsteady flow equations. Two simple storage routing methods, the Method A and the Method B were developed and evaluated. Other simple routing methods evaluated include: the Miskingum, the Puls, and the Kinematic Wave. Complete methods evaluated were the Direct and the Explicit. The methods were evaluated by comparing the results by the methods with the generated results. Comparisons were made on the accuracy of the predicted results, the complexity of the method, and the computation time required for a solution. (Walton-Minnesota)
W73-03263

DETERMINATION OF CHANNEL CAPACITY OF THE MOKELUMNE RIVER DOWNSTREAM FROM CAMANCHE DAM, SAN JOAQUIN AND SACRAMENTO COUNTIES, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. G. Simpson.
Geological Survey Open-file Report, 1972. 64 p, 1 fig, 4 tab, 6 ref, 7 append.

Descriptors: *Channel flow, *Floods, *Reservoir releases, *Streamflow, *California, Flow augmentation, Backwater, Channel morphology, Flow characteristics, Flow measurement, Flow control, Data collections.
Identifiers: *Channel capacity, *Mokelumne River (Calif).

This study evaluates the adequacy of a 39-mile reach of the Mokelumne River in San Joaquin and Sacramento Counties, California, to carry planned flood releases between Camanche Reservoir and the Bensons Ferry Bridge near Thornton. The flood releases from Camanche Reservoir are to be restricted, insofar as possible, so that the flows in the Mokelumne River will not exceed 5,000 cfs as measured at the gaging station below Camanche Dam. Areas of inundation and computed floodwater profiles are based on channel conditions in late 1970 and on observed water-surface profiles during flood releases of about 5,000 cfs in January 1969 and January 1970. Severe backwater conditions occurring simultaneously with a flow of 5,000 cfs in the Mokelumne River can increase the flood stage 4 to 6 feet at Bensons Ferry Bridge. Backwater effects decrease in an upstream direction with stages less than 0.5 foot, 8.6 miles upstream from Bensons Ferry Bridge. A discharge of 5,000 cfs will pass through all bridge openings in the study reach except that of the Western Pacific Railroad Co. bridge. (Woodard-USGS)
W73-03414

RELATIONS BETWEEN HORTON'S LAWS AND HYDRAULIC GEOMETRY AS APPLIED TO TIDAL NETWORKS,
Harvard Univ., Cambridge, Mass. Graduate School of Design; and Harvard Univ., Cambridge, Mass. Lab. for Computer Graphics and Spatial Analysis.
For primary bibliographic entry see Field 02L.
W73-03416

STORM SEWER DESIGN -- AN EVALUATION OF THE RRL METHOD,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05D.
W73-03519

DRAWDOWNS DUE TO CYCLIC PUMPING,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 04A.
W73-03822

USE OF STABILIZERS IN CONTROLLING HOLE DEVIATION,
Hughes Tool Co., Houston, Tex.
H. B. Woods, and A. Lubinski.
American Petroleum Institute Drilling and Production Practice, p 165-182, 1955. 27 fig, 2 tab, 10 ref, append.

Descriptors: Drilling, Rotary drilling, *Drilling equipment, Boreholes, *Stabilization, Deflection, Geologic formations, Mathematical studies, *Computer models.
Identifiers: *Hole deviation, Crooked hole, Drill collars.

Results of a theoretical investigation on use of a stabilizer in drilling crooked formations are given in charts which show: (1) How much more weight may be carried; and (2) Where the stabilizer should be placed. The use of reamers and more than one stabilizer is qualitatively discussed. Advantages of

the use of a stabilizer are given as: (1) More weight may be carried without increasing hole deviation; (2) About the same advantage may be obtained by using a stabilizer with the maximum size collars that can be washed over as with oversized collars without a stabilizer; (3) More weight may be carried with oversized collars and a stabilizer than with oversized collars alone. Disadvantages are: (1) The stabilizer must be placed within a few feet of a definite position; (2) it may be necessary to change the stabilizer position a few times during the drilling of a well. (Campbell-NWWA)
W73-03825

GROUND WATER HYDRAULICS AS A GEOPHYSICAL AID,
Geological Survey, Lansing, Mich.
J. G. Ferris.
Michigan Dept. of Conservation, Geological Survey Division, Lansing, Michigan, Technical Report No. 1, 1948. 12 p, 11 fig, 9 ref.

Descriptors: *Theis equation, *Pump testing, Mathematical studies, *Mathematical models, Hydraulic conductivity, Hydraulic models, Geologic control, *Geologic investigations, Data collections, *Groundwater resources.
Identifiers: Jacob formula, *Hydraulic boundaries, Geologic boundaries, Data interpretation.

The highly idealized aquifer assumed for the derivation of the Theis formula is not of widespread occurrence in the field, but careful study of test data which do not conform to that theory will reveal the means for estimating the degree or manner in which an observed aquifer diverges from the idealized aquifer. Mathematical methods devised by Jacob are used in determining hydraulic boundaries, which often correspond to geologic boundaries. In this manner, the methods presented can assist in the interpretation of local geology. It is alleged that disagreement between hydraulic and geologic evidence in a given problem is untenable and points to misinterpretation of either or both sets of data. (Smith-NWWA)
W73-03832

RADIAL COLLECTOR WELLS ADJACENT TO THE RIVER BANK,
Belgrade Univ. (Yugoslavia).
M. Milojevic.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 89, No 6, p 133-151, November, 1963. 5 fig, 6 tab, append.

Descriptors: Hydraulics, Hydraulic engineering, *Hydraulic structures, Artesian aquifers, Shallow wells, Rivers, *Mathematical models, *Hydrodynamics, Well spacing, Water wells.
Identifiers: Radial collector wells.

Four experimentally obtained formulas are presented for the capacity of radial collector wells in a free water table and in a confined aquifer of limited thickness and unconfined side expansion, located far from any boundaries or ground water replenishment sources, and adjacent to a river bank. The basic assumptions involved are: (1) Homogeneous and isotropic aquifer; (2) absence of ground water flow prior to well operation; (3) steady flow towards well; (4) symmetrical arrangement of the collectors; and (5) constant head along the collectors. Study of the overall well yield distribution among collectors, and along individual collectors, indicates the influence of aquifer thickness, the distance of the well from the river, and the well spacing on those distributions. (Smith-NWWA)
W73-03834

WATER WELL MANUAL,
Ministry of Works and Hydraulics, Georgetown (Guyana).
U. P. Gibson, and R. D. Singer.
Premier Press, Berkeley, California. 1971. 156 p. Price: $5.50.

Descriptors: *Water wells, Drilling, Methodology, Hydrologic cycle, *Aquifer characteristics, Groundwater availability, Water quality, Exploration, Well screens, Fishing, *Installation, Disinfection, Pollution abatement, Pumps, *Domestic water, Grouting, Geologic formations, Well casings.
Identifiers: Well abandonment, *Sanitary protection, Well development, Well rehabilitation, *Well design, Gravel packing, Well completion.

This manual is intended to serve as a basic introductory text book and to provide instruction and guidance to field personnel engaged in the construction, operation and maintenance of small diameter, relatively shallow wells used primarily for individual and small community water supplies. Exploration and development of groundwater sources in unconsolidated formations are covered, primarily for the provision of small potable water supplies. Scope of the manual has been limited to the consideration of small tube wells up to 4 inches in diameter, a maximum of 100 feet in depth and with yields to 50 g.p.m. The location, design, construction, maintenance and rehabilitation of such wells are among the various aspects discussed. (Campbell-NWWA)
W73-03840

MAXIMUM PERMISSIBLE DOG-LEGS IN ROTARY BOREHOLES,
Pan American Petroleum Corp., Tulsa, Okla.
For primary bibliographic entry see Field 08A.
W73-03844

WELL DRILLING METHODS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-03847

GROUND WATER, A SELECTED BIBLIOGRAPHY,
Geraghty and Miller, Port Washington, N.Y.
For primary bibliographic entry see Field 02F.
W73-03850

8C. Hydraulic Machinery

GEOTHERMAL OVERVIEWS OF THE WESTERN UNITED STATES, 1972.
Geothermal Resources Council, Davis, Calif.
For primary bibliographic entry see Field 03B.
W73-03419

GEOTHERMAL ENERGYIN WASHINGTON,
Wshington Dept. of Natural Resources, Olympia. Div. of Mines and Geology.
For primary bibliographic entry see Field 03B.
W73-03431

SYMPOSIUM ON ENHANCED TUBES FOR DESALINATION PLANTS,
Office of Saline Water, Washington, D.C.
For primary bibliographic entry see Field 03A.
W73-03439

THAT ABANDONED QUARRY MAY BE A WATER ASSET,
Philadelphia Suburban Water Co., Bryn Mawr, Pa.
For primary bibliographic entry see Field 05F.
W73-03453

INDUSTRIAL METERING,
Los Angeles Dept. of Water and Power, Calif.
G. A. Wyss.
Presneted at the American Water Works Association Annual Conference, Denver, June 14, 1971. 14 p, 6 fig.

Descriptors: *Metering, *Water meters, *Industrial water, Water supply, Water demand, Engineering evaluation, Criteria, Design criteria, Industrial plants.
Identifiers: *Industrial water metering.

Industrial water users require improved meters with larger capacities, better reliability and improved design and configuration. The industry should be able to provide the utility with basic information of meter size including minimum, maximum and average flow. Pressure and reliability factors should also be considered. The physical requirements of the meters while not stringent, are not to be ignored. Providing sufficient room for meter reading and servicing is important. With multiple meter systems, the manifold should provide even flows across all meters while single meters should be installed so that they are capable of handling the flow without excessive wear, which leads to frequent downtime and customer delay. The simplest meter available is the turbine meter which should always include a by-pass valve. Testing and maintenance programs are essential for good service. (Poertner)
W73-03635

THE DEVELOPMENT OF TECHNIQUES AND EQUIPMENT FOR DEEPER U.S. MINERAL EXPLORATION,
For primary bibliographic entry see Field 08A.
W73-03828

MECHANICS OF CABLE TOOL DRILLING,
Dresser Equipment Co., Columbus, Ohio.
K. M. Mills.
World Oil, p 123-129, September, 1952. 11 fig, 1 ref.

Descriptors: Drilling, Mechanical properties, *Elasticity (Mechanical), *Vibrations, Mathematical studies, *Drilling equipment, Dynamometers, Dynamics.
Identifiers: *Cable tool drilling, Percussion drilling, Modulus od elasticity, Reciprocating motion, *Harmonic motion.

The cable tool drilling process uses a vibratory system consisting of the drilling line and tools. The drilling line acts as a spring, and the tools constitute a mass attached to the free end of the spring. Maximum travel of the tools is created by a reciprocation frequency in resonance with the natural frequency of the vibrating system. The vertical travel of the tools is always greater than the length of the surface stroke. The magnitude of the difference between surface stroke and tool travel is dependent on the ratio of the surface stroke frequency to the natural frequency of the system; maximum tool stroke is produced when the frequency ratio is unity. The kinetic energy of the tools has been found to vary with tool position with in the limits of free travel, being greatest at midstroke. (Smith-NWWA)
W73-03836

SELECTING THE PROPER ROTARY ROCK BIT.
Amoco Production Co., Tulsa, Okla.
J. C. Estes.
Journal of Petroleum Technology, p 1359-1367, November, 1971. 14 ref.

Descriptors: *Rotary drilling, Drilling, *Drilling equipment.
Identifiers: *Rotary drill bits, Tungsten carbide insert bits, Hard-facing, Journal bearings.

Information is presented for the engineer who plans casing and drilling programs and for the tool-

pusher who must select rock bits at the rig. The primary purpose is to offer guidelines for the use of the latest technology so as to avoid obsolete bits and drilling techniques. A brief classification of roller-rock-bits is given, including tooth material and height, cone offset, and journal angle; operating limits based on bit and bearing life are dicussed; several rules for choosing the best rock-bit for a particular formation are given. (Campbell-NWWA)
W73-03842

8D. Soil Mechanics

PRACTICAL DETERMINATION OF THE STRESSES IN A SOIL SUPPORTING A LOAD OF GREAT LENGTH,
Grenoble Univ. (France).
J. P. Giroud.
Construction, Vol 25, No 6, p 221-226, June 1970. Transl from Fr, June 1970. 6 fig, 1 tab, 4 chart, 4 ref.

Descriptors: *Stress analysis, *Soil pressure, *Earth pressure, Soils, Embankments, Stress, Forecasting, Mathematical analysis, Dikes, Lateral forces, Settlement (Structural), Foundations, Shear stress, Dead loads, Graphical analysis, Soil mechanics, Normal stress, Load distribution, Horizontal loads, Loads (Forces), Embankment subsidence.
Identifiers: Continuous footings, Plane strain, Vertical loads, Embankment subsidence.

A graphical method uses chessboardlike figures to determine the vertical, horizonatal, and shear stresses below strucutres; such as, embankments and continuous footings. These stresses are used to perform settlement calculations. Stress determination operations are: (1) Draw the embankment load on transparent paper at a scale that considers the depth of the stress desired and the size of chessboard. (2) Place the drawing on the chessboard and count the number of black and white rectangles covered by the load. (3) Calculate the stress by multiplying the number of rectangles times a given factor and the soil density and embankment height. The method assumes that: (1) the upper boundary of the foundation is a plane, (2) the soil is elastic and homogeneous, and (3) the load induces a field of plane strain in the soil. Although in-place soils are not elastic or homogeneous, the errors in stress calculations are not considered serious. A theoretical basis for developing the chessboards is presented. (USBR)
W73-03309

POJOAQUE UNIT, SAN JUAN-CHAMA PROJECT, COLORADO-NEW MEXICO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Amarillo, Tex. Region 5.

Available from the National Technical Information Service as EIS-NM-72 4732-D, $3.75 paper copy, $0.95 in microfiche. June 14, 1972. 30 p, 2 map.

Descriptors: *New Mexico, *Dam construction, *Reservoir construction, *Environmental effects, *Water storage, Dams, Reservoirs, Flow, Water supply, Sedimentation, Irrigation, Diversion, Irrigable land, Water rights, Spillways, Flood flow, Streams, Erosion, Watersheds (Basins), Flow control, Colorado River Basin.
Identifiers: *Environmental Impact Statements.

The proposed project, part of the Upper Colorado River Storage Project, is the construction of the Nambe Falls Dam and Reservoir. The collection and diversion unit will provide irrigation for 2,768 acres. As part of the project, water will be diverted from the San Juan River for use in the Rio Grande Basin. The dam will be a concrete gravity-arch and earthfill structure with a maximum height of 144 feet. Irrigation releases will be limited to the spring and summer months. The reservoir is located on undeveloped lands having limited agricultural and recreational use. Beneficial impacts include favorable land use changes due to the increased water supply, improved downstream water quality due to the entrapment of sedimentation, improved aquatic habitat, increased fishing and recreational use, and overall aesthetic enhancement. Adverse effects include some damage to downstream ecosystems due to inadequate winter flows, possible loss of the cutthroat trout species, permanent loss of 60 acres of relatively poor wildlife habitat, and short term disruption of environmental tranquility during construction. The only alternative considered was no action. (Bradley-Florida)
W73-03319

BAL HARBOUR, FLORIDA, PARTIAL BEACH RESTORATION, BEACH EROSION CONTROL AND HURRICANE PROTECTION PROJECT, DADE COUNTY, FLORIDA (DRAFT ENVIRONMENTAL STATEMENT).
Army Engineer District, Jacksonville, Fla.

Available from the National Technical Information Service as PB-208 575-D, $3.00 in paper copy, $0.95 in microfiche. April 21, 1972. 13 p, 1 fig, 6 photo, 1 tab, 1 append.

Descriptors: *Florida, *Environmental effects, *Beach erosion, *Shore protection, Erosion, Beaches, Beach erosion, Recreation, Dredging, Hurricanes, Fishing, Inlets, Bulkheads, Landfills, Oceans, Silting, Marine animals, Aquatic life, Sea walls, Dunes, Littoral drift, Coasts.
Identifiers: *Environmental Impact Statements, *Bal Harbour (Fla.).

The proposed project calls for placing 1.8 million cubic yards of sand along an .85 mile stretch of beach shoreline in Dade County, Florida. The purpose of the project is to provide partial beach restoration for erosion control and hurricane protection. Conventional shore protection structures such as seawalls, bulkheads, and revetments have been inadequate to contain the continual beach erosion and provide tidal wave protection. The project calls for the dredging of fill from an ocean borrow pit located 1.5 miles offshore. Within the project area there is no existing protective beach. The environmental effects include the reestablishment of a wide public recreational beach and increased opportunities for offshore sport fishing. Adverse effects include the destruction of some marine organisms, the removal of some animal and marine growth in the borrow area, and some deterioration of water quality due to turbidity and minor silting during construction. Alternatives considered included obtaining needed fill from the shallow bay area to the west of the barrier island, bringing in fill from the mainland by truck, and no action. (Bradley-Florida)
W73-03565

SHORELINE PROTECTION.

Hearing--Subcomm. on Rivers and Harbors--Comm. on Public Works, U.S. House of Representatives, November 20, 1969. 65 p, 5 fig, 3 photo, 4 tab.

Descriptors: *Sedimentation rates, *Beach erosion, *Shore protection, *Legislation, Erosion control, Accelerated erosion, Ocean waves, Tidal effects, Waves (Water), Coastal engineering, Riprap, Seashores, Surf, Great Lakes, Environmental control, Florida, Coasts, Recreation, Public lands, Conservation, Legal aspects, Erosion, Bank protection, Erosion rates.

This hearing took testimony on bills designed to amend 33 U.S.C., Sec. 426 (e), relating to federal participation in the cost of protecting the shores of the United States, its territories, and possessions, so as to include privately owned property within the purview of the act. The question of the basic authority for beach erosion control projects, authorized by Congress to be undertaken by the Corps of Engineers, when the shore is privately owned and there is no public use involved was central to the testimony received. Congressmen testifying in behalf of the bills stressed the necessity of immediate action to preserve shorelines from erosion in their home states. Shoreline studies and reports from the Army Corps of Engineers are also included. The financial degree of federal participation would be limited to a certain percentage of the total cost once the private property owners shoreline was approved for preservation. (Tolle-Florida)
W73-03592

8E. Rock Mechanics and Geology

THE USE OF NEAR-BIT STABILIZER-SUB ASSEMBLIES FOR THE CONTROL OF HOLE DEVIATION,
Reed Roller Bit Co., Odessa, Tex.
For primary bibliographic entry see Field 08A.
W73-03823

STRAIN HARDENING OF A POROUS LIMESTONE,
Rice Univ., Houston, Tex.
J. B. Cheatham, Jr.
Transactions, Society of Petroleum Engineers of AIME, Il. p 229-234, 1967. 8 fig, 8 ref.

Descriptors: Rock properties, *Rock mechanics, Pores, *Porosity, *Limestones, Calcity, Strain, Strain measurement, Hydrostatic pressure, *Mechanical properties, Anisotropy, *Yield strength, Consolidation.
Identifiers: Triaxial tester, *Strain hardening, Confining pressure.

The totality of all stress states for which a solid ceases to behave elastically can be represented as a limit surface in stress space. Probing of such limit surfaces indicates details of strain hardening which are not provided by the standard triaxial testing procedure. Probing tests of the limit surfaces have been performed on Cordova Cream limestone to provide data for extending plasticity theory to cover situations in which consolidation and strain hardening are present. Test results indicate that this highly porous limestone undergoes a permanent volume decrease when it is subjected to hydrostatic pressures in excess of 3,500 psi. A virgin sample tested under a confining pressure of 1,500 psi has a yield strength of 1,700 psi, the yield strength is raised to 2,300 psi. Tests conducted with the axis of the core having different orientations indicate that this rock is also anisotropic. (Campbell-NWWA)
W73-03826

A REVIEW OF THE VARIABLES INVOLVED IN DRAG BIT DRILLING,
For primary bibliographic entry see Field 08G.
W73-03827

MEASUREMENT OF SOME MECHANICAL PROPERTIES OF ROCKS AND THEIR RELATIONSHIP TO ROCK DRILLABILITY,
Societe Nationale des Petroles d'Aquitaine, Pau (France).
S. Gstalder, and J. Raynal.
Journal of Petroleum Technology, Vol 237, p 991-996, 1966. 10 fig, 3 ref.

Descriptors: *Drilling, Physical properties, Rupturing, *Mechanical properties, *Rock properties, *Rock mechanics.
Identifiers: *Hardness test, *Drillability, Punch test.

Consideration was given to simple tests which could be performed on rocks to give a measure of rock drillability. Various methods of breaking rocks were considered, and the standard hardness test was selected for this study. The test involves application of an increasing load on the rock face through a flat-faced cylindrical punch until rupture occurs. Correlations of drilling results with rock hardness measurements were good. It was concluded that hardness, as measured in the lab or deduced from sonic logs, could be used for predicting rock drilling performance. (Campbell-NWWA)
W73-03841

OBTAINING IMPROVED BIT PERFORMANCE IN ABRUPTLY CHANGING FORMATIONS,
Hughes Tool Co., Midland, Tex.
W. J. Highbarger.
Paper presented at the 22nd Annual Meeting of the American Association of Oilwell Drilling Contractors, Denver, Colorado, October 14-16, 1972. 12 p, 7 fig, 21 ref.

Descriptors: *Drilling equipment, *Lithologic logs, Rotary drilling, Drilling, Logging (Recording), On-site tests.
Identifiers: Drill bits, Gamma ray neutron log, Induction electrical survey log, Formation abrasiveness.

A procedure for drilling in abruptly changing lithologies is discussed. This procedure involves the use of electrical and radioactivity well logs and five foot interval drilling times to arrive at operating conditions for the bit and to aid in bit selection. The results of a number of field tests have shown a significant improvement in bit performance. (Campbell-NWWA)
W73-03843

THE MECHANICAL BEHAVIOR OF ANISOTROPIC SEDIMENTARY ROCKS,
Texas Petroleum Research Committee, Austin.
R. McLamore, and K. E. Gray.
Journal of Engineering for Industry--Transactions of the American Society of Mechanical Engineers, Vol 89, Series B, No 1, p 62-76, February, 1967.

Descriptors: Rock mechanics, *Rock properties, Shear, Shear strength, Plastic deformation, *Anisotropy, *Compressive strength, Failure (Mechanics), Shales, Deformation, *Laboratory tests.
Identifiers: Bedding planes, *Cleavage planes, Slate, *Confining pressure, Modulus of elasticity.

The compressive strength as a function of confining pressure and sample orientation was determined for three anisotropic sedimentary rocks (slate and two types of shales). The samples were tested over a confining pressure range of 0 to 40,000 psi, with pore pressure held constant at atmospheric pressure. The orientation of the plane of anisotropy (bedding or cleavage plane) was varied between 0 and 90 deg relative to the axial load. The test results indicate that anisotropic sedimentary materials fail or deform by shear along the bedding plane, shear across the bedding plane, plastic flow along the bedding plane, or internal buckling depending upon the orientation and/or the initial stress state. The strength data gathered were compared to three basic failure theories for anisotropic materials: (a) Walsh-Brace modification of Griffith's theory; (b) single plane of weakness theory; (c) variable coefficient of friction and cohesive strength theory. Over certain pressure ranges and orientations all three theories fit the experimental data. (Campbell-NWWA)
W73-03849

8F. Concrete

BOND DETERIORATION IN REINFORCED CONCRETE SUBJECT TO LOW CYCLE LOADS,
Brown and Root, Inc., Houston, Tex.
M. A. F. Ismail, and J. O. Jirsa.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 6, p 334-343, June 1972. 8 fig, 4 tab, 5 ref.

Descriptors: *Reinforced concrete, *Concrete technology, Beams (Structural), Bonding strength, Deformed bars, Strain gages, Deterioration, Materials testing, Stress, Elastic limit, Loading tests.
Identifiers: *Bond tests, *Cyclic loads, Test results.

The influence of load history on the deterioration of bond along bars subjected to elastic stresses was investigated, using 2 types of specimens. In the first test series, bond deterioration under cyclin cloads applied to a prism axially reinforced was studied. In the second series, stress transfer along bars anchored to support a cantilever beam subjected to cyclic loads was examined. Results indicate that the peak stress reached in previous cycles is the most important factor affecting bond. Repetition of load cycles with constant peak stress produced only a gradual deterioration of stress transfer capacity. Stress transfer characteristics may produce increases in crack width, in the deformation of anchored bars, or in end rotation of fixed-end beams. Where repetition of service loads are expected, provisions for stress transfer at low stress levels may be necessary because in some instances, the effectiveness of the bar in bond is reduced substantially. (USBR)
W73-03305

A METHOD FOR PREDICTING PRESTRESS LOSSES IN A PRESTRESSED CONCRETE STRUCTURE,
Armco Steel Corp., Middletown, Ohio.
R. J. Glodowski, and J. J. Lorenzetti.
Journal of the Prestressed Concrete Institute, Vol 17, No 2, p 17-31, Mar-Apr 1972. 4 fig, 2 tab, 6 ref, append.

Descriptors: *Prestressed concrete, *Concrete structures, *Structural relaxation, Construction materials, Prestressing, Relaxation (Mechanics), Stress analysis, Stressing cables, Structural design, Forecasting, Time, Concrete properties, Concretes, Computer models, Shrinkage, Creep.
Identifiers: *Stress relaxation, Computer-aided design, Relaxation tests, Creepstress relationship, Post tensioning, Pretensioning, Prestressed steel.

Concern in the prestressed concrete industry with stress relaxation in steel tendons has led to development of a computer method of stress prediction. The steel relaxation properties and the concrete creep and shrinkage properties affect the prestress losses. These material properties are affected by such construction factors as temperature, humidity, and pre- or post-tensioning. Time- and stress-dependent equations for concrete and steel properties are used in an iterative program to calculate the prestress losses. For the cases investigated, considerably lower total prestress losses were predicted by this interaction method than by methods that treat the loss causes independently. If the quality of the concrete is poor, little economic advantage is gained by using low relaxation steel. (USBR)
W73-03307

8G. Materials

CORROSION OF METALS IN POTABLE WATER SYSTEMS,
Michigan State Univ., East Lansing. Coll. of Engineering.
For primary bibliographic entry see Field 05F.
W73-03472

REVIEW OF ANTICORROSION WATER TREATMENT,
Lansing Board of Water and Light, Mich.
For primary bibliographic entry see Field 05F.
W73-03490

FEASIBILITY STUDY OF ELECTROMAGNETIC SUBSURFACE PROFILING,
Geophysical Survey Systems, Inc., North Billerica, Mass.
R. M. Morey, and W. S. Harrington, Jr.
Copy available from GPO Sup Doc as EP1.23/2:72-082, $1.25; microfiche from NTIS as PB-213 892, $0.95. Environmental Protection Agency report EPA-R2-72-082, October 1972. 71 p, 66 fig, 2 tab, 6 ref. EPA Project 11024 GRF; 68-01-0062.

Descriptors: *Remote sensing, *Subsurface investigations, *Geologic formations, *Underground structures, *Excavation, *Radar, Profiles, Construction costs, Engineers estimates, Stratigraphy, Bedrock, Soils, Pipes, Electric cables.
Identifiers: *Electromagnetic profiling.

A study was made of a unique radar system which produces a continuous profile of subsurface conditions showing depth and location of geological formations and buried utilities. Information is obtained by sending electromagnetic pulses into the earth and then receiving the reflected pulses from interfaces and objects. The unit travels at 3 mph, and can detect interfaces directly below it to depths of 10 feet in clay and 25 feet in sand. Depth of penetration is governed by conductivity and dielectric constant. Water content influences these soil parameters; an increase in water content decreases penetration. The penetrability of the soil determines the maximum depth at which pipes can be detected. A break in the pipe can be detected by the saturated soil around the break. Limits of penetration have not been reached; work is being done to determine empirical standards of system performance on a wide variety of soils. Since better information yields better cost estimates for designing sewage collection systems, the advantages of the radar system are apparent. (EPA abstract)
W73-03509

A STATE OF THE ART SURVEY OF THE APPLICATIONS OF AERIAL REMOTE SENSING TO COASTAL ENGINEERING,
Clemson Univ., S.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02L.
W73-03523

ENVIRONMENTAL ENGINEERING INVESTIGATION OF UNDERGROUND FORCE MAINS, CORROSION SURVEY AND PIPE MATERIAL ANALYSIS ON A DESIGN LIFE BASIS.
Murphy Engineering, Inc., Chicago, Ill.
For primary bibliographic entry see Field 05D.
W73-03648

NEW WAY TO INHIBIT TROUBLESOME SHALES,
Phillips Petroleum Co., Casper, Wyo.
J. P. Denny, and J. L. Shannon.
World Oil, p 111-117, July 1968.

Descriptors: Drilling, *Drilling fluids, Rotary drilling, Shales, *Bentonite, Oil industry, Density, Viscosity, Logging (Recording), Electrical well logging, Resistivity, *Phosphates, *Polymers, Rock properties.
Identifiers: *Shale inhibition, Drillability.

Two drilling fluid additives, diammonium phosphate (DAP) and polyanionic cellulosic polymer (PAC) are described. These chemicals were found to give the drilling fluid very good properties of clay-swelling inhibition. DAP was found to affect clay chemistry of a drilling fluid much as would additions of sodium chloride, but is not harmful to plant life. An upper limit of concentration of DAP around 10 pounds per barrel was found desirable because of the effects of DAP on logging results. Disposal of the DAP-PAC inhibited fluid presented no more problem than that for a fresh water drilling fluid. (Smith-NWWA)
W73-03824

A REVIEW OF THE VARIABLES INVOLVED IN DRAG BIT DRILLING,
D. P. Singh.
Australian Mining, Vol 61, No 8, p 54-58, August 1969. 5 fig, 32 ref.

Descriptors: Drilling, Rotary drilling, *Drilling equipment, *Rock properties, *Materials, Drilling fluids, Shear, Penetration, Physical properties.
Identifiers: Thrust, Torque, Wear rate, *Drillability, *Drag-bit drilling, Carbide inserts.

The rate of penetration of a drag bit involves a large number of variables. It depends not only on the properties of rocks, but also on drilling tools (size, shape, and material) and on operating conditions (thrust, rpm, quality and intensity of flushing, etc.). The basic variables affecting the rate of penetration of a drag bit may be classified as follows: (1) Rock material; (2) Bit geometry and material of the tip; (3) Thrust; (4) Rotational speed; (5) Torque; (6) Flushing conditions; and (7) Hardness reducers. Each parameter is discussed in some detail. (Campbell-NWWA)
W73-03827

AQUIFER EVALUATION WITH RADIOISOTOPE WELL LOGS,
Geological Survey, Denver, Colo.
W. S. Keys.
In: Proceedings of the National Symposium on Ground Water Hydrology, American Water Resources Association, p 319-328, November, 1967. 3 fig, 7 ref.

Descriptors: Radioisotopes, *Radioactive well logging, Water wells, Groundwater resources, *Logging (Recording), Hydraulic properties, *Aquifer characteristics, Permeability, Tracers.
Identifiers: Natural gamma logging, Gamma-gamma logging, Neutron logging, Epithermal neutron logging, Caliper log.

The radiation logs described include natural gamma, gamma-gamma, neutron-gamma, neutron-epithermal neutron, and radioactive tracer. These logs are shown to provide information on: the source, chemical and physical character, velocity and direction of movement of water; the location, character, continuity, geometry, bulk density, porosity, permeability, and specific yield of aquifers and confining beds; the percent moisture in the saturated zone; and the position of casing, collars, leaks, perforations, and cement. (Smith-NWWA)
W73-03831

METER FOR MEASURING FLOW DISCHARGE FROM PIPES,
Iowa State Univ., Ames.
H. P. Johnson.
Agricultural Engineering, Vol 45, p 378-379, July, 1964. 4 fig.

Descriptors: Flow measurement, *Piezometers, Calibrations, *Manometers, Instrumentation, Water wells, *Orifice flow, Hydraulics.
Identifiers: Field measurements.

Recent interest in water resources emphasizes the need for a practical device for the measurement of discharge of water from pipes. The principal application of such a meter is measurement of discharge from wells. The meter operates on the principle of pressure change resulting from acceleration of flow at a constriction similar to that of an orifice meter. However, the pressure sensed is measured in the plane of the constriction and is a function of static and velocity head. A drawing of the meter, showing all functional parts is given, along with a photograph showing the meter in operation. The flow meter was designed to meet the criteria of portability, ease of use, low cost, and reasonable accuracy for field use. Tests and practical experience have shown that these criteria have been met. (Smith-NWWA)
W73-03835

WATER QUALITY DETERMINATION FROM SPONTANEOUS-POTENTIAL ELECTRIC LOG CURVES,
Saskatchewan Univ., Saskatoon. Dept. of Geological Sciences.
For primary bibliographic entry see Field 05B.
W73-03837

SELECTING THE PROPER ROTARY ROCK BIT.
Amoco Production Co., Tulsa, Okla.
For primary bibliographic entry see Field 08C.
W73-03842

OBTAINING IMPROVED BIT PERFORMANCE IN ABRUPTLY CHANGING FORMATIONS,
Hughes Tool Co., Midland, Tex.
For primary bibliographic entry see Field 08E.
W73-03843

8H. Rapid Excavation

WELL REHABILITATION WITH PRIMACORD,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 03B.
W73-03829

8I. Fisheries Engineering

AGE AND SEASONAL VARIABILITY IN THE FEEDING OF SILURUS GLANIS IN THE LOWER DANUBE FLOW (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
V. P. Bruenko.
Zool Zh. Vol 50, No 8, p 1214-1219, 1971. Illus. English summary.
Identifiers: *Catfish, *Danube River, Feeding (Fish), Flow, Herring, Seasonal, *Silurus glanis, USSR.

The age and seasonal dynamics in the feeding of Silurus glanis was studied in the lower Danube flow. Fingerlings, yearlings and 2-yr-old fishes feed mainly on unimportant and weed fish species. In this respect the role of catfishes is considered as useful since they promote the improvement of the important ichthyofauna composition and the increase of their productivity. Large catfishes feed in May-July on Danube herring and may, to a certain extent, affect the fishery in this period; but during other feeding periods, they are useful.--Copyright 1972, Biological Abstracts, Inc.
W73-03338

CONTROL OF THE INFECTIOUS PROTOZOAN CERATOMYXA SHASTA BY TREATING HATCHERY WATER SUPPLIES,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 05F.
W73-03705

THE EFFECTS OF ELECTROFISHING ON THE INVERTEBRATES OF A LAKE DISTRICT STREAM,
Freshwater Biological Association, Ambleside (England).
J. M. Elliott, and T. B. Bagenal.
Oecologia (Berl). Vol 9, No 1, p 1-11. 1972.
Identifiers: Coleoptera, Diptera, *Electro-fishing, England, Ephemeroptera, Fishing, Gammarus pulex, *Invertebrates, Lakes, Plecoptera, Polycelis felina, Streams, Trichoptera.

The experiments were performed in Dale Park Beck, a stony stream in the English Lake District. Two operators electrofished the sampling area (length 20 m in April and July 1970, and 40 m in May 1971) 3 times (runs 1, 2, 3) in each experiment. Electrofishing caused a marked increase in the number of invertebrates drifting out of the sampling area, and nearly all taxa taken in the bottom samples were also found in the drift samples. The fish shocker was chiefly responsible for the increased drifting of Plecoptera, Ephemeroptera and Gammarus pulex, and these taxa were dislodged from the substratum more easily than Trichoptera, Coleoptera, Diptera and Polycelis felina. The increased drifting of the latter taxa was chiefly due to the disturbance of the substratum by the 2 operators. Most of the invertebrates drifting from the upstream end of the experimental section returned to the bottom within the sampling area. The invertebrate drift out of the sampling area came chiefly from the downstream end of the section, and was equivalent to a loss of only 5% from the total benthos in the sampling area (losses varied between < 1 and 13% for individual taxa).--Copyright 1972, Biological Abstracts, Inc.
W73-03706

ALGINATES AS BINDERS FOR CRUSTACEAN RATIONS,
Louisiana State Univ., Baton Rouge. Dept. of Food Science.
S. P. Meyers, D. P. Butler, and W. H. Hastings.
Prog Fish-Cult. Vol 34, No 1, p 9-12. 1972. Illus.
Identifiers: Diets, *Alginates, Binders, *Crustaceans, Prawns, Shrimp.

Sodium alginate, added to various feed formulations at 0.75% to 3%, is an effective binder for crustacean rations, affording pellet durability as long as 48 hr under tank-test conditions. Use of a stable ration is necessary for slow feeding animals such as shrimp and prawns. Advantages of using the alginate 'system' as a binder include more efficient conversion rates, reduced fouling of the water by destruction of the feed, and concurrent reduction in overall microbial buildup in the crustacean growing area.--Copyright 1972, Biological Abstracts, Inc.
W73-03710

USE OF TANNIN SOLUTION IN WALLEYE AND CARP CULTURE,
New York State Dept. of Environmental Conservation, Rome.
R. F. Dumas, and J. S. Brand.
Prog Fish-Cult, Vol 34, No 1, p 7, 1972.
Identifiers: *Agriculture, Carp, *Tannin, Walleye.

The use of tannin solution on walleye and carp eggs hastened water hardening, toughened shells, and prevented adhesion within and on incubation jars. This treatment was a great labor and time saver.--Copyright 1972, Biological Abstracts, Inc.
W73-03711

ROTATABLE CAGE FOR HIGH-DENSITY AQUACULTURE,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
C. W. Caillouet.
Prog Fish-Cult, Vol 34, No 1, p 8, 1972, Illus.
Identifiers: *Aquiculture, *Equipment, Density, Fish, Fouling, Organisms, Rotatable cage.

A cylindrical cage which can be rotated intermittently on its horizontal axle is described. The cage alleviates the problem of occlusion of its external meshes by fouling organisms. A portion of the cage is out of water and exposed to sunlight and drying and can be easily cleaned while the other portion is under water and contains the fish.--Copyright 1972, Biological Abstracts, Inc.
W73-03715

A SUGGESTED METHOD FOR SEXING BLUE--GILLS,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
J. L. Brauhn.
Prog Fish-Cult, Vol 34, No 1, p 17, 1972.
Identifiers: *Fish physiology, *Sunfishes, Lepomis macrochirus, Methods, Sexing.

Criteria used for separating male bluegill (Lepomis macrochirus) from females include the coloration and length of opercular tabs, coloration of the gular or throat area, pigmentation of the urogenital region, and the size and shape of genital pores. These have been separated from populations of mixed sexes with 90% to 99% accuracy.--Copyright 1972, Biological Abstracts, Inc.
W73-03720

STUDIES ON THE FRESHWATER PLANKTON OF A FISH-POND IN KALYANI, WEST BENGAL, INDIA,
Burdwan Univ. (India). Fisheries Lab.
S. K. Moitra, and S. K. Mukherji.
Vestn Cesk Spol Zool, Vol 36, No 1, p 23-28, 1972, Illus.
Identifiers: *Bengal (India), Fish, Freshwater, *Plankton, Ponds.

Regular plankton hauls were made in a local freshwater fishpond, during Oct. to March, 1964-65. Observations on seasonal distribution and fluctuations of the plankters are recorded for the first time from Bengal waters and are discussed.--Copyright 1972, Biological Abstracts, Inc.
W73-03727

COMPARATIVE STUDIES OF FISHPONDS WITH BROWN WATER IN THE FOREST AREA OF LOWER AUSTRIA,
F. Wawrik.
Hydrobiologia, Vol 39, No 1, p 17-82, 1972, Illus.
Identifiers: *Austria, *Aquatic life, *Brown water, Comparative studies, Fish, Forests, Phyto plankton, Ponds, Zooplankton.

Phytoplankton and zooplankton forms in poor oligomineral ponds, in a pond treated with lime and fertilizers and in a brownish colored pond with an average transparency of 69 cm are identified and compared.--Copyright 1972, Biological Abstracts, Inc.
W73-03728

STUDIES ON THE REPRODUCTION OF CRASSOSTREA IN THE BAY OF CADIZ (IN SPANISH),
Instituto de Investigaciones Pesqueras, Cadiz (Spain).
For primary bibliographic entry see Field 02L.
W73-03821

FISH OF THE FAMILY POLYODONTIDAE (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Developmental Biology.
S. G. Vasetskii.
Vopr Ikhtiol. Vol 11, No 1, p 26-42. 1971. Illus.
Identifiers: *Fish physiology, Acipenseridae, Caviar, Fish reproduction, Pituitary extracts, Polyodon spathula, *Polyodontidae, Psephurus gladius.

The Polyodontidae family consists of only 2 genera and 2 spp.: Polyodon spathula and Psephurus gladius. Recent interest in these fish has been stimulated by their closeness to sturgeons (both families belong to the same order) and attempts at artificial rearing of these fish in the USA have been made in view of the high quality of their caviar (equal to that of sturgeon caviar) and meat. Analysis of the literature data show that the family Polydontidae separated relatively early from the ancestors of all chondrosteoidae as indicated by the more primitive musculature and skeletal structure of the Polyodontidae in comparison with Acipenseridae. The division of Polyodontidae into 2 genera, Polyodon and Psephurus, occurred soon after this group separated from the common ancestor as indicated by the differences in the structure of Polyodon and Psephurus and the similarities between Polyodon and Acipenseridae. Attempts at artificial rearing of Polyodon have not been entirely successful, but preliminary studies suggest that injections of pituitary extracts lead to more rapid maturation of the females which produce eggs that can be successfully fertilized.--Copyright 1972, Biological Abstracts, Inc.
W73-03859

THE ROUTES AND SWIMMING RATES OF THE STARRED STURGEON, ACIPENSER STELLATUS (PALLAS), IN THE LOWER VOLGA DURING SPAWNING AND POST-SPAWNING MIGRATION (IN RUSSIAN),
Tsentralnyi Nauchno-Issledovatelskii Institut Osetrovogo Khozyaistva, Baku (USSR). Azervaidzhanskoe Otdelenie.
T. N. Shubina.
Vopr Ikhtiol, Vol 11, No 1, p 113-123, 1971, Illus.
Identifiers: Acipenser-Stellatus, Migration, *Spawning, *Sturgeon starred, *Swimming rates (Fish), USSR, *Volga River.

Swimming rates and routes of A. stellatus in the lower Volga were at the point where the Muzhich's fishery is located. The results showed that during the spawning season the rate of migration of the different size fish differed, with the largest individual showing the highest velocity. Swimming up the river the fish tended to stay on the left (eastern) bank of the river where the water tended to be shallow and the countercurrent was not as strong. Going upstream to the spawning grounds the fish took periodic rest periods lasting from 5 to 31 min. On return to the feeding grounds the fish migrated on the right side of the bank and did not rest. The hydrodynamic characteristics of sturgeon structure permit them to attain speeds of 10-15 km/day with reference to the river bank. Furthermore, by avoiding the areas of the strongest current, the sturgeons preserve approximately 20% of their energy which would have otherwise been expended on the migration.--Copyright 1972, Biological Abstracts, Inc.
W73-03877

ON THE PIKE PERCH (LUCIOPERCA LUCIOPERCA L.) OF THE UPPER OB RIVER (IN RUSSIAN),
V. P. Solovov.
Vopr Ikhtiol, Vol 11, No 1, p 145-147, 1971.
Identifiers: Lucioperca-Lucioperca, *Ob River, *Perch (Pike), Stocks (Perch), USSR.

Between 1959 and 1964 the upper reaches of the Ob River were stocked with 30.9 million larva of L. lucioperca. The program has been successful as indicated by the recent evidence that the pike perch has spread to the following tributaries of the Ob: Inya, Chumysh, Kasmala, and Alei. It is expected that within the next few years this species shall also be found in the Charyah, Bi, and, partially, Katun Rivers. While in the former years pike perch in the Ob River did not attain the weight and dimensions found in other localities, recently it has been reported that the 5 yr olds exceed in weight those pike perch found in the Novosibirsk water reservoir and in the rivers of the Azov-Black Sea region.--Copyright 1972, Biological Abstracts, Inc.
W73-03878

EXPERIMENTAL STUDIES ON EFFECTS OF INCUBATION TEMPERATURE OF EGGS ON STATE OF EMBRYOS AND LARVA OF THE NEVA RIVER SALMON (SALMO SALAR), (IN RUSSIAN),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Ozernogo i Rechnogo Rybnogo Khozyaistva, Leningrad (USSR).
R. V. Kazakov.
Vopr Ikhtiol, Vol 11, No 1, p 151-156, 1971, Illus.
Identifiers: Embryos, *Incubation, Larva, *Neva River, Salmo-Salar, *Salmon, Temperature, USSR, Weather, Fish eggs.

In the northwestern fisheries of the USSR the incubation time of S. salar may vary from 180 to 230 days. The difference of 50 hr has been explained on the basis of the time of arrival of cooler fall weather and the warmer weather in spring, the time of collection of the eggs and their fertilization. Thus, incubation of salmon eggs always takes place under conditions of variable temperature. Experimental studies conducted to test the effects of temperature on the viability of salmon embryos showed that viability did not differ significantly under the different conditions of temperature corresponding to fall and spring. The survival of the larva from the time of hatching to transition to mixed feeding was highest at 5-6 deg C until the caudal kidney reached a length of 1.5-2.0 mm or greater; highest viability of the larva was then maintained at temperatures of 0.2-0.5 deg C and during the subsequent increase in temperature with the advent of spring. However, the viability of the larva fell sharply when the water temperature in the fall decreased at the stage of blastopore closure. Both the viability of the embryos and survival of the larva were higher when the fall water was warmer than when it was colder (5-6 deg C and less than 5 deg C, respectively.)--Copyright 1972, Biological Abstracts, Inc.
W73-03879

A MORPHO-ECOLOGICAL CHARACTERISTIC OF ESOX LUCIUS L. IN THE MIDDLE REACHES OF THE LENA RIVER (IN RUSSIAN),
L. I. Sokolov.
Byull Mosk O-Va Ispyt Prir Otd Biol, Vol 76, No 1, p 100-104, 1971, English summary.
Identifiers: Ecological studies, Esox-Lucius, *Lena River, *Morphology (Pike), Rivers, USSR, *Pike, Spawning.

The investigation of the morphological characters of the Lena pike showed the presence of a weakly expressed sexual dimorphism. The pike of the Lena basin is characterized by a delayed growth rate. Females reach sexual maturity later than males, at a greater length and weight. Spawning takes place in early June at a water temperature of 5-7 deg C. In the middle Lena this species feeds on small fish of low commercial value. With increasing growth of the pike the absolute size of the prey increases while its relative size diminishes.--Copyright 1972, Biological Abstracts, Inc.
W73-03880

EXPERIMENT IN THE STOCKING OF COREGONOID FISH IN A LAKE OF THE KURGANSK OBLAST (IN RUSSIAN),
N. V. Nesterenko.
Tr Ural Otd Sib Nauchno-Issled Inst Rybn Khoz. 8: p 111-119, 1971.
Identifiers: *Coregonoid fish, *Kurgansk Oblast, Lakes, *Stocking (Fish), USSR.

Attempts to populate the lake with carp and 'ripus' in 1939 and 1944-46 were unsuccessful. In 1958 systematic work was done on the rearing of coregonoid fish. Until 1969 the lake was populated only by hybrids of ripus and Lake Chud whitefish. Peled larvae were first stocked in 1962, and in 1966 stocking was done only with peled. Over a 10 yr period 20 lakes were stocked with coregonoids, with commercial results in 8. The coregonoids grew well. Fish caught at age 1+ had the greatest biomass. Coregonoids for breeding should be caught at age 2+.–Copyright 1972, Biological Abstracts, Inc.
W73-03881

PRELIMINARY RESULTS OF OBSERVATIONS OF FEEDING AND GROWTH IN SILVER CARP JUVENILES IN WARM BODIES OF WATER IN THE URALS (IN RUSSIAN),
E. L. Zubareva, and A. P. Vasil'chikova.
Tr Ural Otd Sib Nauchno-Issled Inst Rybn Khoz. 8: p 223-229, 1971.
Identifiers: *Carp (Silver), Feeding, Growth, *Juveniles (Carp), *Urals, USSR, Warm water.

Experiments showed the possibilities of raising silver carp in warm bodies of water in the Urals.–Copyright 1972, Biological Abstracts, Inc.
W73-03882

ROLE OF ROACH IN THE VOTKINSKOY AND KAMSKOYE RESERVOIRS (IN RUSSIAN),
V. P. Pazderin.
Tr Ural Otd Sib Nauchno-Issled Inst Rybn Khoz. 8: p 237-238, 1971.
Identifiers: Commercial fish, *Kamskoye Reservoir, Reservoirs, *Roach, USSR, *Votkinskoye Reservoir.

In the Kamskoye and Votkinskoye Reservoirs roach are not serious contenders for the food of commercially valuable fish. Measures to preserve their numbers should be found, as they are of commercial value.–Copyright 1972, Biological Abstracts, Inc.
W73-03883

SEXUAL RATIO IN THE OFFSPRING OF RAINBOW TROUT DURING MATING OF PARENTS OF THE SAME AGE (IN RUSSIAN),
N. P. Novozhenin.
Sb Nauchno-Issled Rab Vses Nauchno-Issled Inst Prudovogo Rybn Khoz. 5. p 80-87, 1970, English summary.
Identifiers: Mating (Trout), *Rainbow trout, Ratio, *Sexual ratios, *Trout.

There were more males in the offspring (51.0-60.0%) after individual pairing of rainbow trout producers age 3, 4, 5, 6 and 7 yr old. A percentage predominance of males was observed in the offspring of mated 4-5 yr old producers (55.0-61.0%).–Copyright 1972, Biological Abstracts, Inc.
W73-03884

INFLUENCE OF INITIAL POPULATION DENSITY UPON CONQUEST OF NEW TERRITORIES BY BROWN TROUT SALMO TRUTTA L. IN ARTIFICIAL BROOK (IN FRENCH),
Station d'Hydrobiologie Continentale, Biarritz (France).
M. Heland.
Ann Hydrobiol, Vol 2, No 1, p 25-32, 1971, Illus, English summary.
Identifiers: *Artificial brooks, *Brown trout, Density, Growth, Population, Salmo-Trutta, *Trout.

In 3 identical experimental streams (I, II and III), 100, 50 and 25 brown trout were introduced, at yolk sac resorption. One month later, the numbers of fry were the following: 37 (I), 27 (II) and 14 (III). Territories were not significantly different in number. Moreover, for every stream, daily observations showed a regression in the number of trout swimming, which is faster as the initial density is heavier. At the end of the experiment, the numbers of trout remained the same value for each stream. The slightly lower growth of the (I) batch of trout can be explained by their higher level of aggressiveness and much food distributed into the 3 streams. This spatial competition, which leads to very close densities of trout owning their territory for a given substratum, for any initial density, was observed from the first days following yolk sac resorption.–Copyright 1972, Biological Abstracts, Inc.
W73-03885

POPULATION DENSITY, AGE AND GROWTH OF BARBEL, BARBUS BARBUS (L.) AND GRAYLING THYMALLUS THYMALLUS (L.) IN THE OURTHE RIVER,
Leige Univ. (Belgium).
J.-C. Micha.
Ann Hydrobiol, Vol 2, No 1, p 47-68, 1971, Illus, English summary.
Identifiers: *Barbel, Barbus-Barbus, *Belgium, Capture, Density, *Grayling thymallus, Growth, *Ourthe River, Population density, Rivers, Thymallus-Thymallus.

Estimation of fish populations by the 2 catch effort method was successful for B. barbus (L.) but the mark-recapture method was inefficient. For T. thymallus (L.) the catch effort and the mark-recapture method were not good. Age and growth study in barbel shows that these fish grow more quickly in the Danube than in the Ourthe River. Length-weight relationship studies showed 3 age groups. The first 2 groups had allometric growth and the third age group, with the oldest individuals, had isometric growth. By comparing age and growth in grayling in the Ourthe River and in other European waters, it is shown that growth in the Ourthe is quicker than in the Scandinavian Svartbacken, and slower than in the Welsh Llyn Tegid. Coefficient calculation in length-weight relationship shows 2 age groups with allometric growth.–Copyright 1972, Biological Abstracts, Inc.
W73-03886

ICHTHYOFAUNA OF THE IRIKLINSK RESERVOIR AND ITS PROSPECTIVE COMMERCIAL USE (IN RUSSIAN),
Y. A. Koz'min, and V. P. Matyukhin.
Tr Ural Otd Sib Nauchno-Issled Inst Rybn Khoz. 8. p 3-26, 1971.
Identifiers: Bream, Carp, Fauna, *Iriklinsk Reservoir, Perch, Pike, Reservoirs, Roach, USSR, *Ichthyofauna.

There were 28 spp. and subspecies of fish and 1 hybrid counted in the Iriklinskoye Reservoir. The main commercial fish were bream, pike perch, ide, perch, roach and white bream. Though there were some wild carp, their numbers were kept down by the limited areas suitable for spawning. As a result of the decreased water level and freezing in the winter the littoral zone was devoid of water vegetation and the fish of a substrate. Different fish predominated in different inlets of the reservoir. The size, age composition, fecundity, and temperature for spawning were given. A series of measure for improvement of the ichthyofauna were proposed.–Copyright 1972, Biological Abstracts, Inc.
W73-03887

BOTTON DWELLING FAUNA AND THE DIET OF FISH IN THE IRIKLINSK RESERVOIR (IN RUSSIAN),
M. L. Grandilevskaya-Deksbakh, and E. V. Shilkova.
Tr Ural Otd Sib Nauchno-Issled Inst Rybn Khoz. 8: p 55-71, 1971.
Identifiers: Algae, Bream, Bryozoa, Chrionomids, Cladocera, Crustaceans, Cyclopoids, Fauna bottom dwelling, Insects, *Iriklinsk Reservoir, Molusk, Plants, Reservoirs, Roach, USSR, *Fish diets.

This study was done in March and June-Aug. 1963. The biomass of benthos in the reservoir averaged 6.2-7 g/m2. The bottom fauna of the stretches and inlets was of a uniform group composition. The benthos consisted mainly of chironomid larvae. The fish used for the study were caught in nets. The nutrition of the same species of fish in different parts of the reservoir differed by components and their amount. Bream juveniles fed mainly on demersal cladocera and cyclopoids. Adult bream fed mainly on chironomid larvae as well as some mollusks and zooplankton. Ide juveniles fed on demersal cladocera, cyclopoids, young larvae, pupae, imago chironomids and other insects. Adults ides consumed plants, glochidia, mollusks, bryozoa and chironomid larvae. Roach juveniles consumed pelagic and demersal crustaceans, larvae, imago chironomids and other insects, higher plant life, and filamentous algae. Data on the nutrition of other fish are given. current food interrelationships developed among the juveniles of all the fish for the use of pelagic and demersal lower crustaceans and some benthic forms. The greatest correspondence in the food spectrum was observed on the consumption of chironomid larvae by adult fish.–Copyright 1972, Biological Abstracts, Inc.
W73-03888

AGE COMPOSITION, RATE OF GROWTH, AND NUTRITIONAL STATE OF LAKE PLESHCHEEV PIKE (ESOX LUCIUS L.), (IN RUSSIAN),
Gosudarstvennyi Pedagogicheskii Institut, Yaroslavl (USSR).
A. A. Kulemin, I. I. Makkoveeva, and M. I. Solopova.
Vopr Ikhtiol, Vol 11, No 1, p 43-48, 1971.
Identifiers: Age, Esox-Lucius, Growth, Lakes, Nutritional state, *Pike, USSR, *Lake Pleshcheev.

Studies were conducted on the state of E. lucius in the Pleshcheev Lake in Yaroslav Region. These observations were initiated in 1961 when fishing was forbidden in spring due to depletion of the pike population. The present series of observations were conducted from 1964-1969. The yearly ban on fishing for commercial purposes and sport resulted in an increase in pike population with an especially pronounced increase in the numbers of adult individuals. The data also indicated that the highest rate of growth occurs after the fifth yr of life, and that fishing in the spring season, especially with nets, selectively depletes the younger individuals which are still in a state of slow growth. The mean weight of pike in Lake Pleshcheev was 234 g for the 2 yr olds and 3957 g for the 8 yr olds; the corresponding lengths were, respectively, 263 mm and 728 mm. The rate of pike growth in Lake Pleshcheev was slower than in other lakes (Nero, Galichskoe) and upper Volga. However, the relatively low pike population in this lake, despite the more than adequate food sources, suggests that perhaps this may be due to some natural factors dealing with, for example, the offshore plants and the coast, in addition to excessive fishing by local and visiting fisherman. Consequently, the local fisheries department should attempt to stock the lake artificially as well as enforce the ban on fishing during spring.–Copyright 1972, Biological Abstracts, Inc.
W73-03889

REPRODUCTIVE BIOLOGY OF FRESHWATER TROUT, SALMO MYKISS WALBAUM, IN A RESERVOIR OF KAMCHATKA RIVER (IN RUSSIAN),
Tikhookeanskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva i Okeanografii, Petropavlovsk-Kamchatskii (USSR).
V. A. Maksimov.
Vopr Ikhtiol, Vol 11, No 1, p 49-57, 1971, Illus.
Identifiers: Biology, *Kamchatka River, Migration, *Reproduction (Trout), Reservoirs, Salmo-Mykiss, *Trout, USSR.

Since very little is known about the reproductive biology of S. mykiss (Walbaum), studies were conducted on this species of trout during their migration in Kishimshina river in 1969 and 1970. Kishimshina river has its sources in the bogs of the tundra and empties into Kamchatka river 65 km from the latter's mouth. Spawning by S. mykiss takes place in the spring and corresponds to the inflow of thawed water from the tundra and the adjacent mountains. In 1969 migration was initiated on June 6 when the water temperature rose to +4.0 deg C; the duration of migration was 20 days and during time the temperature varied from +2.4 deg to +15.6 deg C. Migration ceased when the water temperature dropped to +2.4 deg C. Spawning began on June 12 and ended at the end of the month; during this time the gonads evidenced greater degree of maturation in the males than in the females. This species of trout spawns at sandbanks at a depth of 15-20 cm, where the flow of water is 0.2-0.5 m/sec, pH 6.5-7.1, CO2 10.21 mg/l, and an O2 content of 9.68 mg/l. In similarity to the American salmon, Salmo mykiss builds nests and buries its roe to a depth of 10-15 cm. The age of the spawning fish varied from 4-7 yr, with the majority of the spawning fish being 5-6 yr old. The sexually mature males were longer and heavier than the sexually mature females. During their lifetime the fish spawn 1-4 times.--Copyright 1972, Biological Abstracts, Inc.
W73-03890

NEW DATA ON DIRECT AGE DETERMINATION OF PINK SALMON (ONCORHYNCHUS GORBUSCHA (WALBAUM)) OBTAINED BY MARKING THE FISH, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Animal Morphology.
Y. E. Lapin.
Vopr Ikhtiol. Vol 11, No 1, p 64-76. 1971.
Identifiers: *Age determination (Salmon), *Fish marking, New, Oncorhynchus-gorbuscha, *Salmon (Pink), Scales.

It has commonly been accepted that the pink salmon matures at the age of 2 yr. Such conclusions have been reached based on morphometric analyses of their scales at the time of spawning. However, studies conducted with salmon with marked fins in the Amur and Kamchatka region have shown that maturation occurs at 2 and 3 yr. A single narrow band of sclerites on the scales can, therefore, be interpreted in the case of the pink salmon as reflecting a certain stage in the ontogenesis of this fish (i.e., increased rate of growth at times of plentiful food) which need not correspond to age. The assumption of a 2 yr maturation period leads to erroneous conclusion regarding population dynamics of salmon. Consequently, the need for accurate determination of maturation is self-evident, and the most promising approach seems to rely on direct marking of the fish.--Copyright 1972, Biological Abstracts, Inc.
W73-03891

STRUCTURAL CHARACTERISTICS OF SCALES OF YOUNG SOCKEYE SALMON (ONCORHYNCHUS NERKA, WALBAUM) FROM LOCAL POPULATION OF AZABACHE LAKE, (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institut Morskogo Biologii.
S. M. Konovalov, V. E. Il'in, and G. Y. Shcherbinin.
Vopr Ikhtiol. Vol 11, No 1, p 77-91. 1971. Illus.
Identifiers: *Azabache Lake, Oncorhynchus-nerka, Population, Rings, *Salmon (Sockeye), *Scales, Structural characteristics, USSR.

A study was undertaken of the scales of sockeye salmon in Azabache Lake, which is a reservoir of Kamchatka River. Quantitative and qualitative evaluation of the scales showed that in the young salmon they may be divided into 3 categories: a group in which the scales have true annual rings; a group without winter narrowing; and a group with 1 or more false annual rings. No definitive conclusions can be made at the present time with respect to the significance of these variations. These fish differ in their ecological environment; however, it is felt that the differences reflect more than mere phenotypic variations but represent actual genotypic differences which are passed from generation to generation.--Copyright 1972, Biological Abstracts, Inc.
W73-03892

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ANNUAL REPORT OF ACTIVITIES FOR FISCAL YEAR 1972,
Nebraska Univ., Lincoln. Water Resources Research Inst.
Warren Viessman, Jr.
Annual Report No 8, 1972. 66 p, 2 tab, 89 ref. OWRR A-999-Neb (1c).

Descriptors: Annual Reports, *Water Resources Research Institute Reports, *Nebraska, Projects, Grants, Research and development, Water quality, Model studies, Evapotranspiration, Water law, Urbanization.

Since 1965 twenty-nine allotment and matching grant projects have been supported by the Nebraska Water Resources Research Institute. Topics studies range from ecological impact of surface water impoundments in the Great Plains to a simulation of the effects of dynamic water pricing policies. During fiscal year 1972 five matching grant and nine allotment projects were in progress. Current research subjects include: (1) water quality with emphasis on agricultural pollution and euthrophication (A-014, A-020, A-024, B-004 and B-012); (2) analysis of water resources systems with particular consideration given to conjunctive use models, hydrologic system models, ecosystem models, irrigation system models, management models and sediment transport models (A-021, B-010); (3) evaporation and transpiration with emphasis on microclimate studies, evapotranspiration models, phreatophyte studies and water potential-plant response studies (A-015, A-017); (4) water law (B-007); and (5) urban water systems (A-023, A-025, B-016).
W73-03265

9C. Research Facilities

QUARTERLY PROGRESS REPORT, JULY 1 - SEPTEMBER 30, 1972.
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 05G.
W73-03444

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT OF ACTIVITIES FOR FISCAL YEAR 1972,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 09A.
W73-03265

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition AND Processing

AVALANCHES--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02C.
W73-03260

10B. Reference and Retrieval

SEARCHING THE SOCIAL SCIENCE LITERATURE ON WATER: A GUIDE TO SELECTED INFORMATION STORAGE AND RETRIEVAL SYSTEMS PRELIMINARY VERSION,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 06E.
W73-03254

10C. Secondary Publication AND Distribution

AVALANCHES--A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 02C.
W73-03260

LEGAL ASPECTS OF WATER POLLUTION IN NEW JERSEY AND PENNSYLVANIA: A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 05G.
W73-03276

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A. Centers of Competence		
American Water Works Association Research Foundation, Public Water Supply Treatment Technology	W73-03453 -- 03479 03481 -- 03500 03655 -- 03671	64
Bureau of Reclamation, Engineering Works	W73-03305 -- 03309	5
Colorado State University, Irrigation Return Flow Quality	W73-03261 03758 -- 03787 03789 -- 03802	45
Cornell University, Policy Models for Water Resources Systems	W73-03691 -- 03694	4
National Water Well Association, Water Well Construction Technology	W73-03822 -- 03850	29
Oceanic Research Institute, Coastal Pollution	W73-03441 -- 03452	12
University of Arizona, Arid Land Water Resources	W73-03605	1
University of Florida, Eastern U. S. Water Law	W73-03276 03311 -- 03336 03339 -- 03363 03559 -- 03604	98
University of Texas, Wastewater Treatment and Management	W73-03672 -- 03685 03687 -- 03689	17
University of Wisconsin, Eutrophication	W73-03275, 03310	2
U. S. Geological Survey, Hydrology	W73-03277 -- 03304 03403 -- 03432 03521 -- 03543 03545 03547 -- 03549 03551 -- 03558 03730 -- 03731 03733 -- 03757	120
B. State Water Resources Research Institutes		
Arizona Water Resources Research Center	W73-03544	1
Connecticut Institute of Water Resources	W73-03262	1
Michigan Institute of Water Research	W73-03399	1
Minnesota Water Resources Research Center	W73-03263	1
Mississippi Water Resources Research Institute	W73-03264	1
Nebraska Water Resources Research Institute	W73-03265 -- 03267	3

Source	Accession Number	Total
B. State Water Resources Research Institutes (Cont'd)		
Nevada Center for Water Resources Research	W73-03268	1
North Carolina Water Resources Research Institute	W73-03269 03400 -- 03402	4
Oregon Water Resources Research Institute	W73-03654	1
Texas Water Resources Institute	W73-03270	1
Virginia Water Resources Research Center	W73-03271 -- 03274	4
C. Other		
Agricultural Research Service	W73-03546	1
BioSciences Information Service	W73-03259 03337 -- 03338 03480, 03550 03686, 03690 03695 03697 -- 03729 03732, 03788 03803 -- 03821 03851 -- 03900	112
Engineering Aspects of Urban Water Resources (Poertner)	W73-03633 -- 03651	19
Environmental Protection Agency	W73-03251 -- 03252 03501 -- 03520 03652 -- 03653	24
Ocean Engineering Information Service	W73-03364 -- 03398 03606 -- 03629 03696	60
Office of Saline Water	W73-03433 -- 03440 03630 -- 03632	11
Office of Water Resources Research	W73-03253 -- 03258 03260	7

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

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ABSTRACT SOURCES

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